SCIENTIFIC AMERICAN

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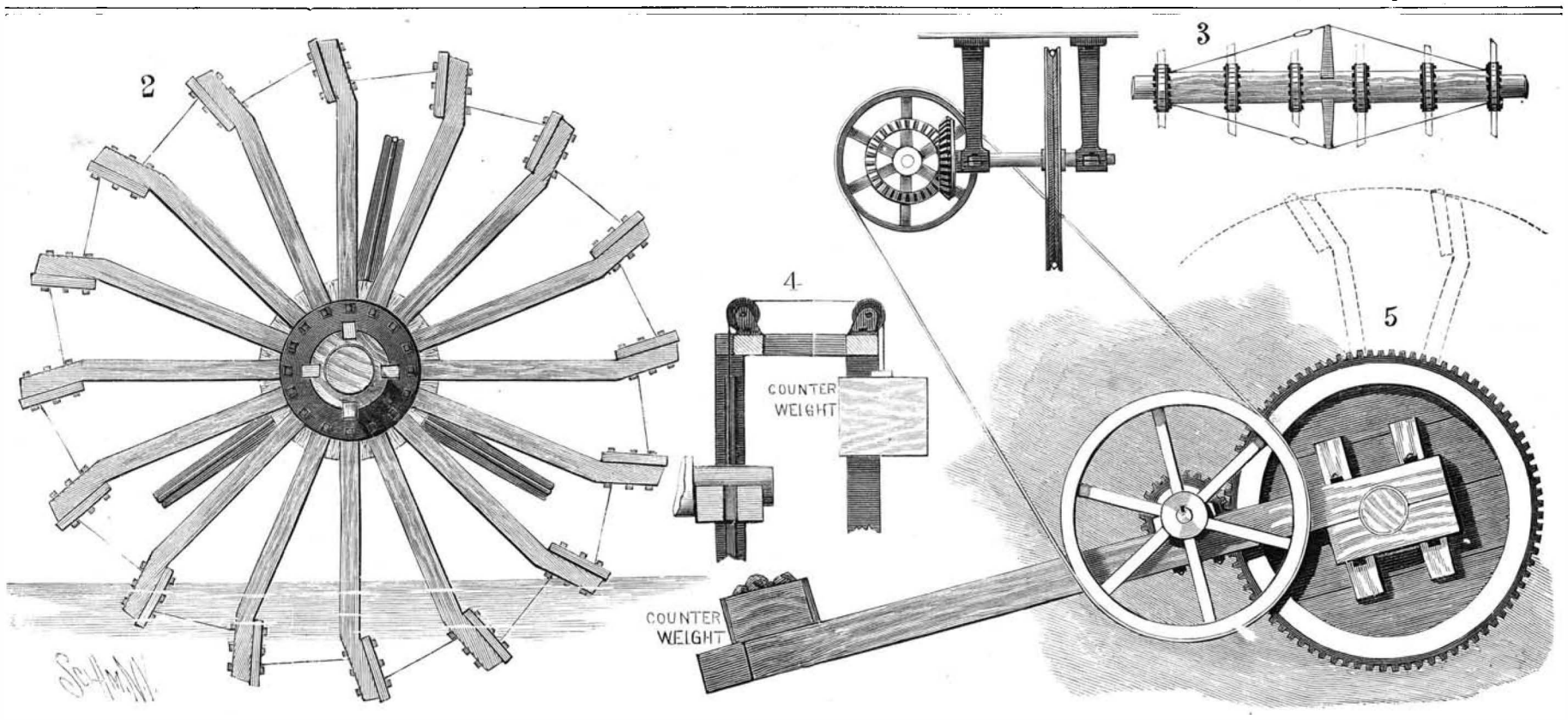
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXVIII.—No. 3. ESTABLISHED 1845. NEW YORK. JANUARY 21, 1893. $3.00 A YEAR. WEEKLY.



1. General view of wheel and outer counterpoising. 2. Side end view of wheel. 3. Bracing of wheel shaft. 4. Counterpoising. 5. Adjustment for varying water level.

ADJUSTABLE UNDERSHOT WATER WHEEL FOR VARYING WATER LEVEL, OF THE POTSDAM RED SANDSTONE CO.—[See page 38.]

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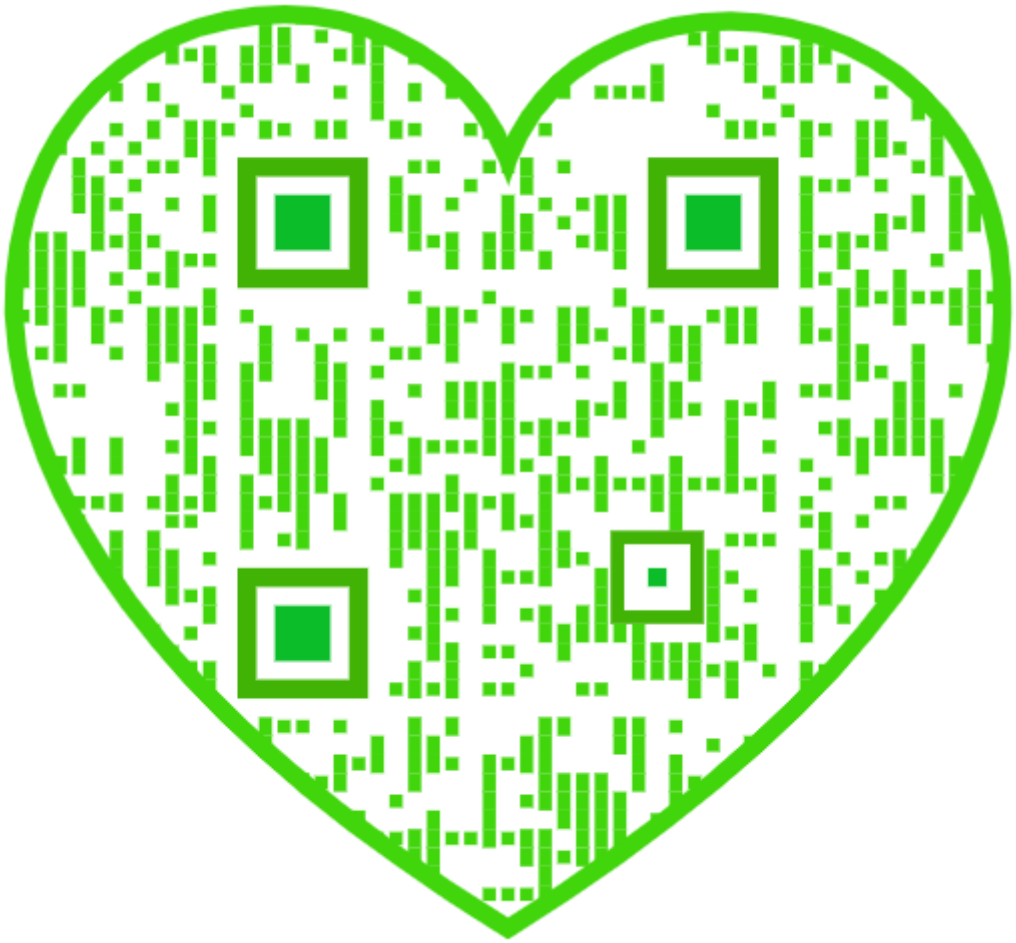

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

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361 Broadway, New York

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NEW YORK, SATURDAY, JANUARY 21, 1893.

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PROGRESS OF WORLD'S FAIR WORK AT CHICAGO.

Although the weather was cold enough in Chicago early in January to freeze ice fourteen inches thick on the lagoon in the fair grounds, the work of getting ready for the great Columbian Exposition, to be opened there next May, has not lagged in any department. The ice was properly cut and carried off to the cold storage warehouse, while the officials proceeded to complete the rules and regulations touching the cost of light, heat, and power, and make plans for the grand military review at the time of the opening. All the buildings will be lighted, but if exhibitors desire a special illumination, they can have it by paying $8 for each 16 candle power light for the period from May 1 to October 31. The rate for steam power is $40 per horse power. Those requiring only occasional power will be charged 4 cents per horse power per hour. The charges for electric power, exclusive of a fee of $10 or $15 for making connection with the main cable, are:

For one-quarter horse power and less	$20
For more than one-quarter horse power and not exceeding one-half	40
For more than one-half horse power and not exceeding one..	75
For more than one horse power and not exceeding two.....	70
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For more than three horse power	50

The electric lighting at the fair is designed to surpass all prior attempts at illumination. About the avenues and walks 1,650 arc lights will be disposed, and there will be 4,500 of them in the buildings. The incandescent system will be employed wherever practicable. Fully 100,000 of the glass bulbs are to be used. They will be threaded along the cornices and about the domes and spires. Even the lawns and flower beds in certain parts of the grounds are to be made resplendent by the tiny electric lobes.

The work of laying railroad tracks through the several buildings has now progressed so far that the receipts of exhibits upon the grounds is becoming large, and the directors say that there must be constant pressure from now on to hurry them forward. On January 9 twenty carloads of exhibits were actually unloaded within the exposition buildings, and this may be said to have formed the practical commencement of the work of installation.

The big greenhouses and the horticultural building have been scenes of great activity during the January cold weather, for there has been a competitive pre-exposition primrose exhibit, in which were shown five thousand pots of primroses, arranged artistically and according to hybridization, color, habit and class. The show was a most rare and beautiful one, the flowers being produced from seeds furnished by the leading flower and seed firms of the United States, to whom awards are to be made according to a plan covering color and habit. Under the big dome and beneath the floor of the horticultural building there is also an immense mushroom cellar, kept at a temperature of 95° Fahrenheit, from which the restaurant cooks obtain every morning a great supply of this delicate fungus. Inside the doors of this great structure, however cold may be the weather outside, the temperature is that of the tropics. Warm draughts of air are wafted through its extensive reaches, and warm sprays of water sprinkle the palms and ferns and other tropical trees and plants, and the appearance everywhere is that of a land of perpetual summer and sunshine.

In the electrical building several exhibits are already arranged, and dynamos are set up and ready to furnish power. The Bell Telephone Company is here erecting a stand 100 feet square for its exhibit, the display to cost $22,000. The Edison General Electric Company has also begun preparing the space for its exhibit.

The Cable Roads of New York City.

The present state of cable road construction in New York City is as follows:

The track construction of the Broadway & Seventh Avenue road is completed from the Battery to Central Park and but little yet remains to be built between the Battery and South Ferry. The uptown power station, at 51st Street and Sixth Avenue, is practically completed and the machinery in place. The boilers were fired last Tuesday, and the cable, which is of steel wire wound on a hemp core and is 1½ inches in diameter, will be run in before the end of the week. At the downtown station, at Houston Street and Broadway, the work is about one month behind that at 51st Street, but it is expected that 125 cars will be in operation before March.

The Third Avenue cable road is completed with the exception of short stretches in front of the two power stations and at 125th and 129th Streets and a short piece extending from the terminus of the East River bridge to the end of Park Row. The east track over this length is now being built, and when completed the west track will be put in. The uptown power station, at 65th Street, is rapidly nearing completion, the building being now up to the second story. The downtown station, at Bayard Street and Bowery, is much behind the other, being barely up to the street level. This is due to the extensive and difficult excavation that was necessary in order to make room for the enormous machinery.

On the 29th ult., franchises for the construction of surface roads in Lexington Avenue and Ninth Avenue were to be sold. A company known as the Lexington Avenue & Pavonia Ferry Railroad Company has been formed for the purpose of building and operating a cable road on Lexington Avenue if they are successful in obtaining the franchise. The Broadway cable road will bid for the Ninth Avenue franchise, and will introduce the cable if they get it. At all events it is probable that, owing to the municipal limitations to mechanical traction in the streets of the city, the cable will be used on both these important lines.—*Railroad Gazette.*

The Colorado Desert.

The fact that considerable areas of the Colorado Desert, so called, were susceptible of reclamation by use of the water from the Colorado River and from other sources has more than once been pointed out in these columns. That fact has been known to a few for many years, and a noted pioneer of the State, Dr. O. M. Wozencraft, spent many years in a fruitless effort to persuade Congress to undertake that reclamation on a large scale. Unhappily, however, he encountered the ignorance and obstinacy of men in nowise acquainted with the desirability of such an enterprise, and consequently he went to his grave without securing the fruition of his hopes.

A proof of the feasibility of this scheme of reclamation was afforded during the past season, when the exceptionally heavy rains caused the water of the Colorado to attain a higher point than it had been known for years. The banks of the river to the west were in consequence overflowed and the water spread to a depth of two or three feet for no less than forty miles or more on the desert. This water has since subsided, and in consequence of the thorough saturation of the soil there has sprung up a heavy growth of grasses, which affords pasturage to cattle and sheep driven across the desert from Arizona, and which are an unfailing index to the fertility of the soil. It is demonstrated in an indisputable manner that with the water of the Colorado suitably diverted and properly handled, many thousand acres of desert may be made productive in the highest degree.

All that is necessary is the enterprise which shall embark in a comprehensive system of reclamation. That an abundant reward awaits the genius who shall undertake and carry such a scheme to perfection no one doubts who is at all conversant with the situation.—*Irrigation Age.*

A Golden City in Africa.

We find in the London *Times* a letter giving a striking description of the remarkable town of Johannesburg in the Transvaal, which is well called "The Golden City." Its name even does not appear on the maps of Africa issued ten years ago. It will be a surprise to multitudes to know that there is any such spot on the African continent. The city stands upon a gold reef, upon which reef fifty companies are now working, employing 3,370 white men and over 32,000 natives. Of the city of Johannesburg itself, the writer says:

"It is neither beautiful nor impressive from the æsthetic point of view, but it might be set down as it stands in any part of the civilized world. It has a population of about 40,000. The buildings are good, the streets are broad, there are shops with plate glass windows full of ball dresses and silver plate, the residential quarters are rapidly spreading themselves out into squares and boulevards, a tram line connects them with the business center, for twenty miles east and west you may see the funnels of mining works smoking against the sky, the sound of an engine whistle is in your ears, and you find that a tram has been constructed, which runs from one end of the Rand to the other. The town is lit with gas, water is supplied to all its houses, every ordinary appliance of civilization is here, and when you remember that it has all been done in five years, and that every scrap of material has been carried up, and the six pianos waiting at the frontier will presently be carried, by ox wagons, you begin to realize something of the extraordinary conditions which can have called so sudden a development into existence."

MR. C. A. HAMMOND, Superintendent of the Boston, Revere Beach and Lynn Railroad, suggests the feasibility of using the telephone instead of the telegraph for the transmission of railroad messages and train orders. He states that for ten or twelve years past the telephone has been in use on his short railroad for the purposes mentioned, with much success. He is of opinion there are no greater dangers of error by the use of the telephone than with the telegraph, while there are many advantages in favor of the telephone. In the case of wrecks or other stoppages, the whole situation may be more quickly ascertained at headquarters, and measures taken to get the line in proper order for operation than could be done by telegraphing in the ordinary way.

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Needed Enlargement of Machinery Hall.

According to Mr. James Dredge, member of the Royal British Commission, there is likely to be a great lack of space for American mechanical exhibits at the Columbian Exposition. In a recent lecture before the Society of Arts, London, he says :

The Machinery Hall, which is one of the great buildings in the central court, is 850 feet long and 500 feet wide, with an annex of 500 feet by 550 feet; the east front faces on the central court and the north adjoins the Administration Building. Three main galleries occupy the length and width of the area; they are about 130 feet wide, and are crossed in the center by a transept of the same width. The roofs of these galleries and transept are in each case semicircular, the height of springing of the arch being about 22 feet from the floor level. Each rib is free to turn on three points —the two bed plates and a central point at the summit of the roofs. The ribs thus consist of two half arches connected by a central pin, and constructed of light iron lattice girders of the type already referred to, excepting at the base and the summit of the arch, where solid panels are introduced for the whole width of the rib, which is about 6 feet. At the intersection of the transept, the ribs of which cross those of the galleries at right angles, the former are so spaced as to serve as the base for the rectangular iron framework that rises above the top of the ribs, and forms the foundation for three flat domes of 130 feet in diameter, rising to the height of more than 50 feet above the ribs. By this arrangement the arched framework of the transept is removed, and its place is taken by the series of three domes rising to a height of about 130 feet above the floor. The domes are circular in plan, and the space between the lower boundaries and the corners of the rectangular frame above spoken of, as resting on the arched ribs, is filled in with a flat roof. At each corner of the building is an entrance pavilion, surmounted by a domed roof, and in the center of the north and east sides there are large entrance porticoes flanked by towers 200 feet high. Outside the arched galleries just described, and surrounding the building, are flat-roofed courts framed in timber and sheathed with fibrous plaster. These courts are in two stories, affording an extensive promenade on the ground floor and a large gallery space above. The longitudinal framework of the iron portion of this structure is very elaborate, and cannot be described in so brief a notice as the present. The roof is to a large extent covered with glass, and, so far as can be judged, the arrangements provided for lighting and ventilation cannot fail to be satisfactory. The building was designed with a view to erecting it hereafter as a great railway station, to which purpose it can be admirably adapted. The construction of the annex calls for no particular comment, nor does that of the power station adjoining. This power station will form probably one of the most interesting parts of the machinery section, as it will contain the boilers, engines, and dynamos for generating all the power required throughout the Exposition, about 24,000 horse power. The various units of this station will constitute exhibits. The adoption of electricity on a very large scale for driving the machinery in motion will be one of the new departures at the Columbian Exposition, it will be exclusively used in the annex, which is framed wholly in timber, but in the main hall steam will be employed. As in the Paris Machinery Hall, overhead rails will run from one end of the buiiding to the other, and on these traveling platforms will be placed for the convenience of visitors. These platforms will be electrically driven.

The area of the Machinery Hall is 17½ acres, which is divided as follows :

	Square feet.
Main hall	425.000
Annex	269.990
Total	694,990

This area is not quite so large as that of the Machinery Hall and its annexes at the Paris (1889) Exhibition. As, however, it is hardly to be expected that foreign nations will require so much space for this class of exhibit in Chicago as they did in Paris, it might have been supposed that the space allotted to American exhibitors would have been sufficient for the purpose. This does not appear to be so, however, and, according to the report of Mr. L. W. Robinson, the demands for space are altogether out of proportion with what can be supplied. The statement that there are 17½ acres of floor space is in itself somewhat misleading, because from this total many important deductions have to be made. These deductions are approximately as follows :

	Square feet.
Stairways, restaurants, entrances, etc.	56,990
Foreign sections	175,000
Power plant for engines and dynamos	112,974
Engines for driving American exhibits	3,000
Deduction for aisles, avenues, and passageways	116.675
Total net space for American exhibits	220,351

It will be seen from the foregoing figures that the space available for American exhibits and machinery sinks into really insignificant proportions. That this is so will be a cause of deep regret and disappointment to those American manufacturers who will be unable to display their specialties with advantage, and also to the numerous foreign visitors, to whom the show of American machinery will be one of the principal attractions. It would seem, indeed, that unless some very extensive annexes be made to this building, the Machinery Hall will be a general source of disappointment, because it will be incapable of doing full justice to that branch of American industry which has made such prodigious progress during the last few years. Six months ago the applications for space represented more than four times the total amount available, and the unsatisfactory problem which Mr. Robinson is called upon to solve is to satisfy exhibitors who require 900,000 feet of space with one fourth of that amount. Those who call to mind the American section in the Machinery Hall of the Centennial Exhibition in 1876 will remember that it was densely crowded, and yet it covered an area of more than 100,000 feet greater. It is true that on that occasion exhibits relating to electricity, to transportation, and to mines and mining were all grouped within the Machinery Hall, but in 1876 none of these classes occupied a great deal of space. At Chicago a vast building has been allotted to each of these groups, and the prospects are that they will be densely packed with exhibits.

When the progress that has been made during the last 18 years in mechanical arts is borne in mind, there is no reason for surprise that the demand for space is far greater than the supply, and it would almost appear as if the organizers of the Exposition had lost sight of the fact that the pressure in this department will be unprecedented. Mr. Robinson, the chief of the department, writes at a recent date in a somewhat desponding tone as follows: "Either three-quarters of the applicants must be left out, or cut down to one-fourth of the space applied for, or finally the chief of the department must take upon himself the responsibility of placing on the space available the representative firms who have applied, and eliminate the less consequential applicants. Thus the manufacturers of the country will suffer greatly by not being able to make as full a display of their products as they would otherwise be entitled to do, and there will be many strong and enterprising concerns who will not be represented. Unless additional buildings are provided, the whole brick and tile industry will not find a place, nor will fire engines and fire extinguishing apparatus secure a location. Besides these, heavy machinery, like drop hammers, steam hammers, and machinery requiring fire for its operation, like forges, special boilers, gas and oil machinery, must be omitted."

Worsteds.

A further reply to Mr. Brennan's question: Worsteds are generally classed under the head of wool goods without any distinction as to their special construction. The manipulation of the wool to make a piece of worsted differs very much from that necessary for the production of woolens. Although both are composed of wool, they are two different materials. A worsted is made entirely of wool direct from the sheep's back, and must be of sufficient length to permit of being combed. This is a very important distinction, for other wool yarns may be made from wool that has before seen service in a garment, and being reconstructed into a wool substance called shoddy, and being mixed with a greater or less amount of pure wool, according to the yarn desired to be produced, is again converted into yarn. Worsted yarn is made not only of wool in its first stage from the sheep's back, but from wools sufficiently long in staple to permit of being combed.

After the wool is taken from the sheep's back it is passed on to men trained in ascertaining the various qualities of wool, and by them sorted into the several grades that the fleece contains. The number of qualities or grades of fineness of the fibers in a fleece varies according to the breed of the sheep. Some classes of wool contain as many as fifteen distinct varieties. By the quality of wool is meant its adaptability to produce so many number of yards of thread to a given weight. After beng sorted, the desired quality of wool to produce a certain yarn is taken into the wash house and thoroughly washed by a machine in warm water and soft soap. All the grease and dirt are removed by this process. It is then passed on to the carding room; the carding machine opens out the fibers of the fleece and places them perfectly straight, so that a continuous rope of wool is run off the machine. The fibers of wool vary in length, some being long enough for worsted yarn, while others are not.

In the process of washing and the natural growth of the wool, some of the fibers become worked into little balls like pinhead specks, which, if permitted to pass into the yarn, would make a specked effect in the cloth. These must be removed by the comb, and in order to do this the wool is passed from the card to the back-wash, from back-wash to punch, from punch to comb. Wool combing machines are of various constructions, such as Noble's, Holden's, and Lister's, but the principle of all is the same, in that the wool is drawn through fine steel pins, which permit the straight sliver of wool to pass through rollers, while the short, knotty bits are carried to the noil tin. The long combed wool is known to the trade as *tops*, while short, knotty portion is called *noils*. The top alone is used to produce worsted yarn, and the noil is used for making a woolen yarn chiefly to be employed in making blankets, although it is equally serviceable for making woolen cloth or woolen dress goods.

After the wool sliver leaves the comb, it is passed through a series of machines called gill boxes, and made into balls ready for the drawing room. In the drawing, each operation will reduce the weight of wool in a given length entering the machine according to the counts the wool has to be spun to. The next and last operation for making a single yarn is the spinning room. In the spinning a perfectly even and fine thread is produced and wound on to a bobbin. The process of spinning is now completed, and the next thing to be considered is the design and color of cloth.—*Geo. Simpson, Wade's Fiber and Fabric.*

Tommasi's New Multitubular Electric Accumulator.

Dr. Donato Tommasi's accumulator is characterized by electrodes inclosed in a tubular envelope or sheath of metal or insulating material, either rigid or elastic (celluloid, ebonite, caoutchouc, etc.), perforated by a multitude of little holes.

In the center of this sheath is arranged a core of lead or other suitable metal or alloy serving as a current conductor, and in contact, on each of its faces, with a layer of oxide of lead which is preserved from falling or disintegration by the perforated envelope which imprisons it.

The immediate consequence of this arrangement is to double, for a given weight, the proportion of the active matter and, consequently, the capacity of the accumulator

Thus, the advantages of the multitubular accumulator are explained from three points of view, the capacity, the weight and the volume.

The charge is made by such a system that it can attain, without inconvenience, 5 to 6 amperes per kilogramme.

The discharge can vary from 1 to 4 amperes per kilogramme of the electrodes. It should be stopped when the tension is lowered to 1·7 volt. In the case of variable strains, when sudden power is needed, the Tommasi accumulators can stand, without inconvenience, intensities of from 6 to 8 amperes per kilogramme of electrodes.

The electrical constants of this accumulator are the following :

Initial electromotive force	2·4 volts.
Capacity per kilogramme of electrode	20 amperes.
Result in quantity	95 p. c.
Result in work	80 p. c.

In announcing a capacity of 20 ampere hours that can be utilized per kilogramme, Mr. Tommasi has adopted a system of discharge which can vary from 1 to 3 amperes per kilogramme of electrodes. It is evident that, if less were employed, the capacity would be increased.

Comparison.—To give an idea of the great electric capacity possessed by the Tommasi accumulator, it is only necessary to compare this capacity with that of the best types of accumulators known, which are most used in electric lighting and traction, and thus we find that the capacity of the multitubular accumulator is 3·3 to 5 6 times that of the best types known.

The arrangements employed in the accumulator of Dr. D. Tommasi show, as will be seen, considerable progress beyond those that have been produced heretofore. The simplicity and strength of its construction make of it an absolutely industrial apparatus, which will have to render immense services, and consequently destined for a great future.

Coal Consumption of War Vessels.

Tests of the coal consumption of some of the United States war vessels have shown the following results: The Newark, which has triple expansion horizontal engines, indicating 9,131 horse power, burned 2·434 pounds of coal per horse power per hour. The Concord, with the same style of engines, indicating 3,513 horse power, burned 2·76, and the Bennington, indicating 3,533 horse power, burned 2·6 pounds per horse power per hour. The rate of consumption was about 40 pounds of coal per square foot of grate surface per hour with a forced draught. The coal used by the Newark was semi-bituminous, of excellent quality, and that used by the other ships was a good quality of anthracite.

Dimensions of the New Cunard Steamers.

In an article in the SCIENTIFIC AMERICAN of December 31 relative to English-American steamers the dimensions of the new Cunard steamer Campania were given as 700 feet length, 20,000 tons. This was an error. The above are the proposed dimensions for the new White Star steamers. The new Cunard boats Campania and Lucania are 620 feet length, 65 feet 3 inches beam, 43 feet depth, 12,500 tonnage.

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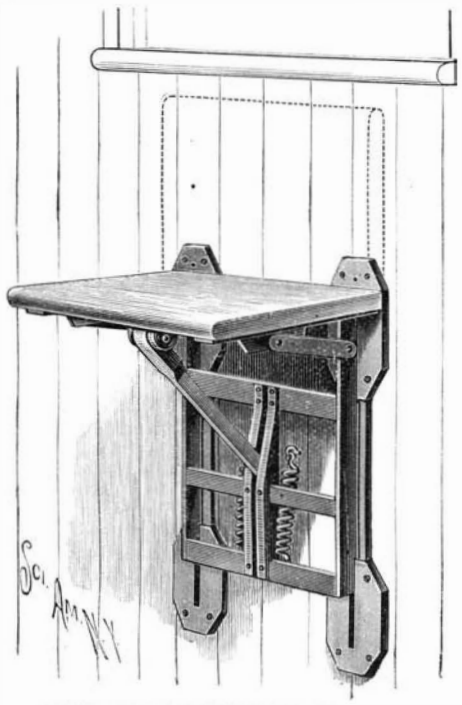
A SIMPLE, COMPACT FOLDING SEAT.

A safe, easy and convenient seat, especially adapted for use in locomotive cabs, is shown in the illustration, and has been patented by Mr. John S. Kilgore, of Salida, Col. The seat is supported on parallel slide-ways, which receive the flat flanges of the side pieces of the seat frame, cross bars making the frame rigid. The frame is supported by spiral springs, whose upper ends are secured to screw eyes in the walls of the cab. In

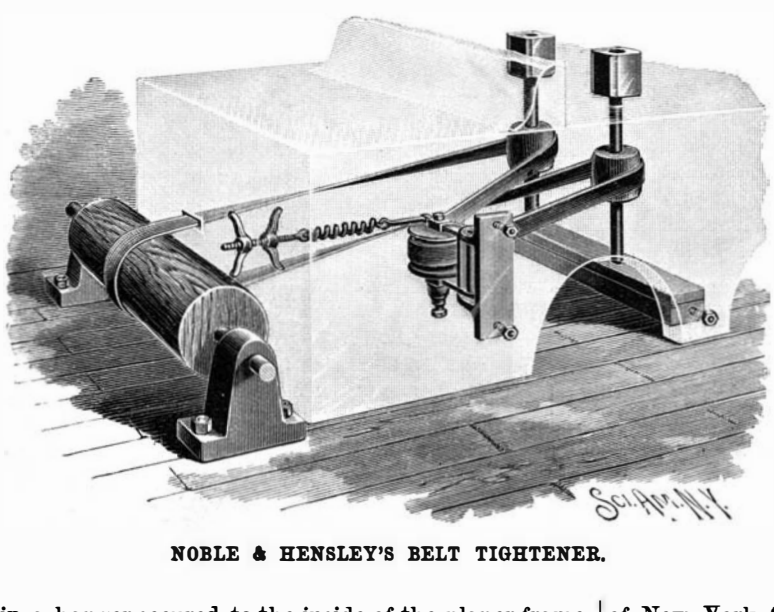


KILGORE'S LOCOMOTIVE CAB SEAT.

parallel guide bars near the center of the frame is pivoted the inner end of a swinging brace whose outer end is pivoted between angle clips on the under side of the seat, and pivoted links connect the ends of the seat bottom with the upper ends of the side pieces of the sliding seat frame. When the seat is used its lower edge is pulled out slightly, and the seat drops to place, its back edge resting on the upper ends of the side pieces of the sliding frame, and the brace swinging out into position, as shown, the seat being folded, as indicated by the dotted lines, by raising its inner sides with the hands, or simply by the inward pressure of the limbs upon its front edge, which causes the seat bottom to swing up into vertical position. The seat may be applied to any cab to occupy the least possible amount of space, while it has no lateral motion, and the spring supports it in a manner to make a very easy and comfortable seat.

AN IMPROVED BELT TIGHTENER.

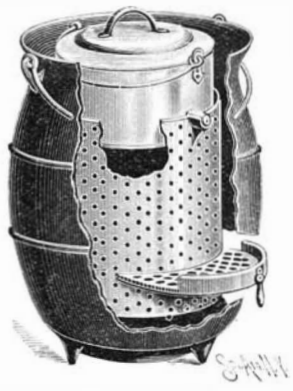
The device shown in the illustration is especially adapted for use on planing, sizing, matching, moulding and similar machines, admitting of quick application and ready operation to tighten or slacken belts. It is also designed to lessen the cost of belting, as both the right and left hand cutters may be connected with the driving pulley by a single belt, and, as different faces of the belt pass over the tightener and the cutter head shafts, any shavings, chips or foreign material caught by the belts at the cutter heads will be discharged at the tightener. The improvement has been patented by Messrs. John B. Noble, of Tatum, and Joseph B. Hensley, of Baird, Texas. It is shown applied to a planer, the tightening pulley being mounted in boxes in a yoke-like frame pivoted in a hanger secured to the inside of the planer frame. The outer end of the frame is connected by a rod with one end of a spiral spring, from whose opposite extremity a rod passes through an opening in the end of the planer frame, the end of the rod being threaded and carrying two lock nuts engaging the inner and outer faces of the end piece of the planer frame. By the turning of these nuts the yoke carrying the pulley may be moved toward or from the cutter head shafts, to give the proper tension to the belt, the spring having a cushioning effect, although the spring may be omitted if desired. The weight of the tightening pulley is supported by an adjusting screw in the lower box, and the pulley also has end flanges to prevent the belt leaving it. The single belt employed passes from the driving pulley around one cutter head shaft, thence around the tightener and to the other cutter head shaft, and back again to the driving pulley. It will be seen that, by means of this device, the belt tension may be readily increased or diminished while the machine is in motion, without interfering in the least with its regular work. Manufacturers of planing and matching machines and others desiring to use the improvement may address Mr. J. B. Noble, Tatum, Texas.



NOBLE & HENSLEY'S BELT TIGHTENER.

AN IMPROVED COOKING VESSEL.

The improvement shown in the illustration, forming the subject of a patent issued to Mrs. A. R. Isaac, of New York City, consists of a vessel adapted to be held in a pot of water to permit the contents of the vessel to be steamed or boiled without escaping therefrom, an additional receptacle being also provided for the cooking of the sauce. The vessel is preferably made of sheet metal, open at the top and bottom and with many perforations in its sides, and near its bottom is an opening in which slides a perforated plate, having a flange and hinged handle on its outer edge. On sliding the plate inward, it rests upon brackets secured to the inner face of the body, and forms a removable bottom for the body of the vessel. In suitable sockets in the upper edge of the vessel rest the trunnions of an additional receptacle or saucepan. With the perforated plate or false bottom in its innermost position, the material placed in the vessel to be cooked will be either steamed or boiled, according to the quantity of water in the pot, the contents of the saucepan being in either case heated by the steam. After the cooking has been effected, the vessel is placed upon a platter or other dish and the sliding plate is drawn out, when the contents are deposited in a body, unbroken, in the dish provided therefor, obviating the necessity of removing the articles piece by piece. Further information relative to this improvement may be obtained by addressing the patentee, P. O. Box No. 773, New York City.



ISAAC'S COOKING VESSEL.

Chromium by Electrolysis.

In a recent issue of the *Comptes Rendus* of the Paris Academy of Sciences, M. Em. Placet describes a new method of preparing chromium by electrolysis. An aqueous solution of chrome alum is first made, to which is added an alkaline sulphate and a little sulphuric acid, and a current is then passed through the solution. Pure chromium is then deposited at the negative pole. Thus prepared, the metal is of a bluish-white color and very hard. It resists atmospheric influences, and is not attacked by concentrated sulphuric acid, by nitric acid, or by a concentrated solution of caustic potash. It is proposed to carry on chrome plating on an industrial scale, to replace the nickel plating. Good adherent deposits of chromium have been obtained from the same bath on brass, gun metal, copper, and even on iron. The deposit is said to resemble oxidized silver. An ingot of the pure metal, weighing one pound, has been prepared and sent to the academy by the inventor of the process, who is now engaged in investigating various alloys of the metal.

The Hudson River Ice Crop.

The Hudson River ice harvest is now in progress. It begins sixty miles north of New York City. The ice is ten inches thick, and is pure water ice, so clear that one can read a newspaper through the blocks. The indications are that the ice crop this year will be the largest and finest ever gathered on the river, and will reach nearly 4,000,000 tons.

A NOVEL MUSICAL INSTRUMENT.

The musical novelty shown in the engraving, which the inventor has christened the pneumatone (Gr. *pneuma*, breath or air) has been patented by Mr. Clark S. Mudge, of Bettsville, Ohio. A thin disk, preferably of celluloid or similar material, is held on a stud projecting from a plate which has at its lower end an angular offset connected with or integral with the handle, and on the face of the disk is held an adjustable plate having an elongated slot loosely engaging the stud, so that the latter plate can be moved up or down on the face of the disk, and secured in desired position by a thumb nut. On the lower end of this plate is an angular extension, a rod connected with which extends downward through the offset of the other plate, a spring being coiled around the rod, whose lower end is threaded and fitted with a large nut. This rod forms the one key or slide used, and that only in producing a very high note, in which case it is pressed up, and in making a very low note, when it is allowed to go back to its lowest position by spring pressure. In playing the pneumatone the operator has only to place the exposed part of the circular disk to his lips and force the air against and over the disk, which will cause it to vibrate to produce a musical tone, which can be changed by the tongue and mouth much the same as in whistling. The pneumatone is 6½ x 1½ x ½ inches in size, making it a very convenient instrument to carry in the pocket.

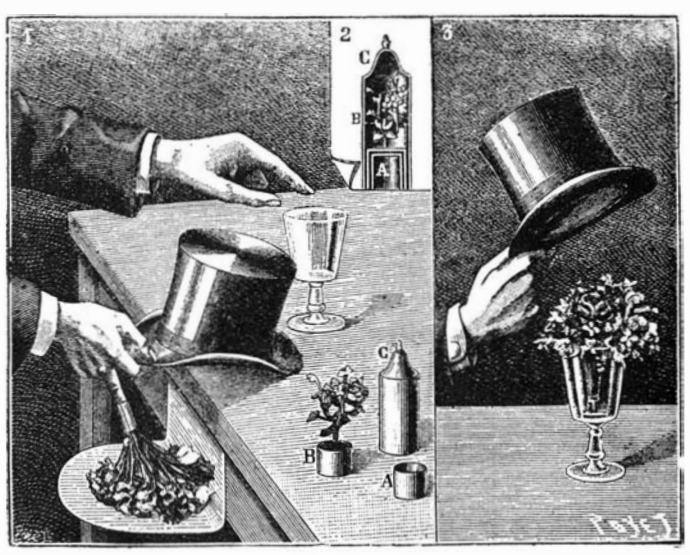
MUDGE'S "PNEUMATONE."

AN INTERESTING FLOWER TRICK.

The trick that we about to describe, although old, is very interesting. The prestidigitator comes forward holding in his hand a small cardboard box which he says contains various kinds of flower seeds.

"Here there is no need of moisture, earth, or time to cause the seed to germinate, the plant to spring up and the flower to bloom. Everything takes place instantaneously. Would not a rose in my buttonhole produce a charming effect? A stroke of the wand upon the seed deposited in the desired place, and see! the rose appears. A few seeds in this little box (Fig. 1 A), that we shall cover for an instant so that it cannot be seen how flowers are born. . . . It is done; let us take off the cover: violets, forget-me-nots, and Easter daisies are here all freshly blown.

"You are suspicious, perhaps, and rightly, of the little tin box, and more so of its cover. Well then! here is a small goblet the transparency of which is perfect, and this borrowed hat with which I cover it can have undergone no preparation. Let us remove it quickly, for the flowers. . . What! no flowers? Ah! it is because I forgot to sow the seeds. Let us begin the operation over again. What flowers do you want?



THE BIRTH OF THE FLOWERS.

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—a mignonette, a violet, a marigold? Here is a seed of each kind, which I shall put into the glass. Now let each one tell me the flower that he prefers. Now I cover the glass, and count three seconds . . . See the magnificent bouquet!" (Fig. 3.)

Finally the trick is finished by taking from the hat a number of small bouquets that are offered to the ladies. The following is an explanation of it:

1. *The Buttonhole Rose.*—This is a stemless artificial rose of muslin, which is traversed by a strong black silk thread arrested by a knot. To this thread, which should be 5 or 6 inches in length, is attached quite a strong rubber cord capable of being doubled if need be. The free extremity of the rubber traverses, in the first place, the left buttonhole of the coat, and then a small eyelet formed beneath, and then passes over the chest and behind the back, and is fixed by the extremity to one of the right hand buttons of the waistband of the trousers.

When the prestidigitator comes upon the stage, the rose is carried under his left armpit, where he holds it by a slight pressure of the arm. At the proper moment he raises his wand toward the right, and looks in the same direction in order to attract the eyes of the spectators to that side; but at the same time he separates his arms slightly, and the rose held by the taut rubber suddenly puts itself in place. The magic effect produced by the instantaneous appearance of this flower, coming whence no one knows where, could not be appreciated without having been seen.

2. *The Flowers in the Small Box.*—In this second appearance of flowers, produced by means of the small apparatus shown in Fig. 2, there is really nothing very mysterious. The special object of it is to bring into relief the experiment that is to follow, and in which, evidently, there can be no question of double bottom. Moreover, the diversity of the means employed contributes powerfully toward astounding the spectators.

Fig. 2 shows in section the three pieces of the apparatus, which are placed separately upon the table in Fig. 1. A is the cylindrical tin box in which the seeds are sown, and B another box of slightly larger diameter, but in other respects just like the first, which it entirely covers. To the bottom of B is fixed a small bouquet of artificial flowers. By slightly squeezing the cover, C (which is of thin brass), toward the bottom, the box, B, with the bouquet, is lifted. If, on the contrary, the box is left upon the table, the spectators do not perceive the substitution made, and think that they all the time see the first box, whence they believe the flowers started.

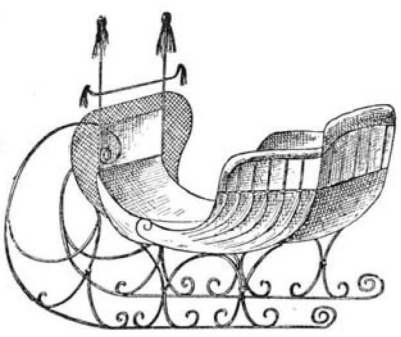
3. *The Bouquet in the Glass.*—This is the most interesting part of the experiment.

As we have said, the glass is first covered with a hat, and the prestidigitator feigns astonishment upon seeing that the flowers have not appeared, but at the very instant at which the hat is lifted, when all eyes are fixed upon the glass, looking for the bouquet announced, the operator, who, with the right hand, holds the hat carelessly resting upon the edge of the table, suddenly sticks his middle finger in the cardboard tube fixed to the handle of the bouquet, which has been placed in advance upon a bracket, as shown in Fig. 1, and, immediately raising his finger, introduces the flowers into the hat, taking good care (and this is an important point) not to turn his gaze away from the glass to the bouquet or hat, as one might feel himself led to do in such a case. This introduction of the bouquet should be effected in less than a second, after which the hat is held aloft, while with the left hand some imaginary seeds, the kinds of which are designated in measure as they are taken, are selected from the cardboard box and successively deposited in the glass. So, this time, be certain of it, the flowers will appear.

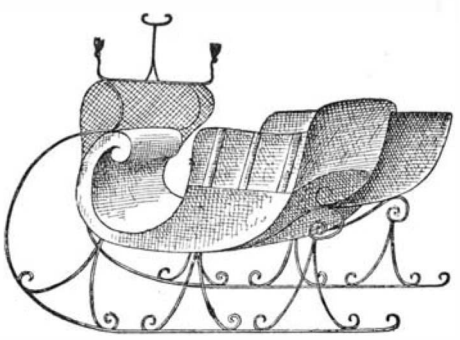
4. *The Small Bouquets in the Hat.*—There is not a second to be lost; the spectators are admiring the bouquet and are astonished to see it make its appearance. The operator very quickly profits by this moment of surprise to introduce, by the same process as before, a package of small bouquets tied together with a weak thread that will afterward be broken in the hat. We have not figured these bouquets upon the bracket, in order to avoid complication. Of course, a skillful operator will not hasten to produce the small bouquets. He will advance toward the spectators as if the experiment were ended, and as if he wished to return the hat to the person from whom he borrowed it. Afterward, making believe answer a request, he says: "You wish some flowers, madam? And you too? And are there others who wish some? I will then empty into the hat the rest of my wonderful seeds, and we shall see the result." It is at this moment that the spectators are attentive and that all eyes are open to see the advent of the flowers.

Never forget that with prestidigitators it is almost always too late when one thinks of watching them.—*La Nature.*

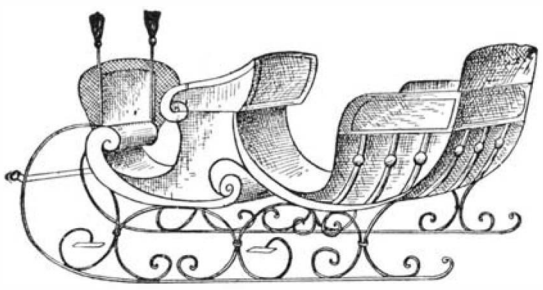
A RUSSIAN SLEIGH 1794.



TUB SLEIGH.



RUMBLE SLEIGH.



TUB VICTORIA.

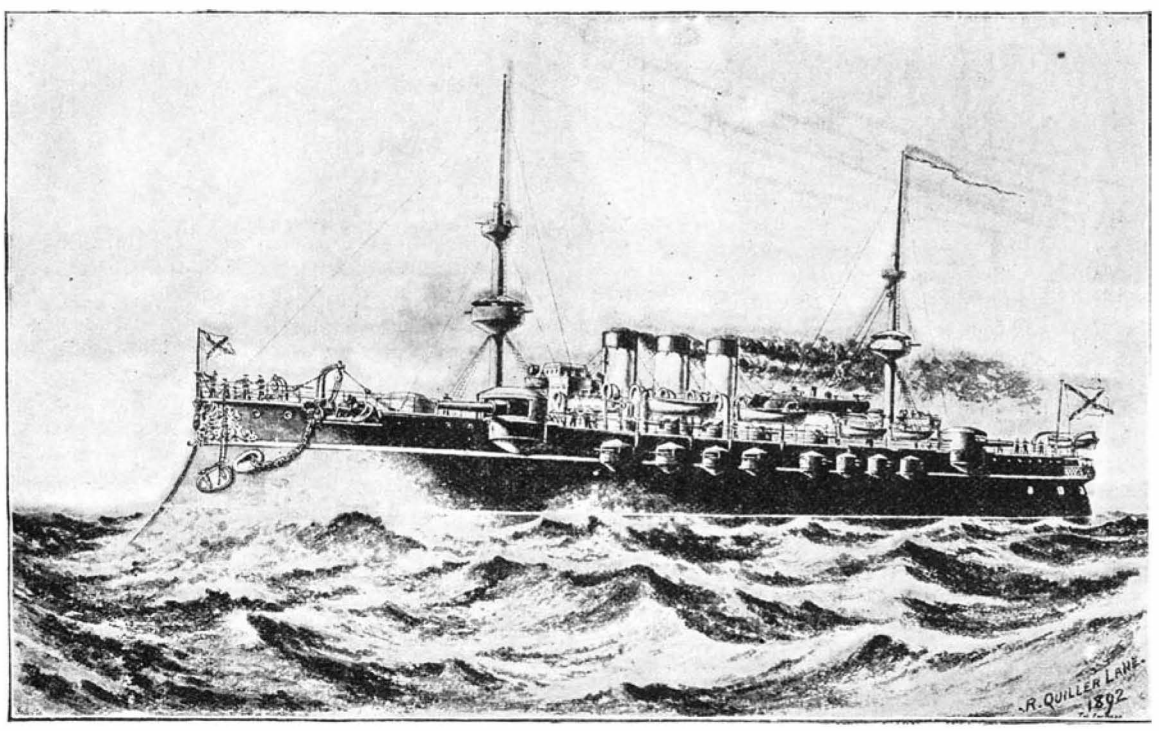
VARIETY IN SLEIGHS.

The various designs of sleighs which one sees on the park driveways, and on all the thoroughfares in the neighborhood of large cities, when the winter happens to be such as to afford a season of sleighing, afford a highly attractive feature of outdoor life at such periods. In the latitude of New York City, along the Atlantic coast, although the temperature often falls in the winter months to about the zero figure, it is seldom that the snow fall and the temperature are both such, for any considerable period, as to afford any noteworthy season during which riding on runners is feasible. It is on this account that, when there happens to be in any one winter several consecutive days when sleighing is possible, every sort of vehicle adapted to travel on runners is pressed into service, and what may be styled a regular "sleighing carnival" is indulged in.

The Russian sleigh shown in one of the accompanying views is a unique specimen of a class by no means small, it having been the custom of the rich in Russia for many years to provide themselves with very costly and highly ornamented sleighs, as sleighing in that country, during several months of each year, affords about the only means of communication over vast stretches of territory.

The "tub" sleigh and the "tub Victoria" shown, as well as the same general pattern of single sleigh with a rumble, are styles frequently seen on the roads around New York. In the latter case the driver in livery perched high up behind controls the team, the lines passing through rein supports. The dashes are provided with wire fenders and decorated with plumes, the colors of which are in harmony with those of the paint on the sleighs.

There was a time when the patterns for sleighs could be counted on the fingers of one hand; now they are to be numbered by scores. The old square box has almost disappeared. The Albany cutter and its larger counterparts, the four and six seat sleighs, appear in diminished numbers, and contribute their share to the variety of the picture. The Portland sleigh is a favorite among light cutters, while Americanized Russian, Canadian and other types of sleighs appear in almost endless variety, forming a most picturesque spectacle, in which color, form and motion are all united to make the "sleighing time" scene on our suburban boulevards a most attractive and animated one.



THE RUSSIAN WAR SHIP RURIC.

THE RUSSIAN WAR SHIP RURIC.

The new Russian cruiser Ruric is of 10,923 tons displacement, and measures 435 ft. long, over all, by 67 ft. beam and a draught of 29 ft. 9 in. She is what is frequently called an armored cruiser, and belongs to the class which includes the Imperieuse of 8,400 tons and the Galatea of 5,600 tons displacement; the French Dupuy de Lome of 6,297 tons, the Latourch Neville of 4,745 tons displacement, and the American New York of 8,150 tons and the Maine of 6,648 tons displacement, as well as ships protected with sloping armor like our Blake of 9,000 tons and Edgar of 7,350 tons displacement, the French Cecille of 5,766 tons and the Alger of 4,160 tons displacement; and also the American Columbia of 7,475 tons displacement. *The Engineer* says she is almost 2,000 tons greater displacement than the heaviest of those mentioned above, and in respect of length she eclipses the others—by over 60 ft. in the case of the Blake, the longest of them.

As at present arranged, her protection consists of a belt covering some 80 per cent of total length of the ship, 7 ft. in depth, and tapering from 10 in. at the normal water line to 5 in. below it; over this there is to be a steel deck 2½ in. thick, of curved form, and covering the whole of the vital parts of the vessel, as well as sloping down fore and aft, where the armored belt affords little or no protection. The principal guns will be placed in armored sponsons, two at the forward end and two at the after end of a secondary battery, also in armored sponsons, etc. Her armament will consist of four 8 in., sixteen 6 in., fourteen 4·7 in., and eighteen quick-firing guns, and five tubes for Whitehead torpedoes. An armored conning tower for the protection of the captain in action, and the chutes by which the ammunition is conveyed to the guns on upper deck, will also be well protected by steel armor. Her motive power will consist of four sets of

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triple expansion engines, which are expected to develop 13,250 indicated horse power, with natural draught, driving twin screws, which will give her a sea speed of 18 knots. It is expected, however, that she will be able to exceed this speed when necessary. At her ordinary load draught she can carry sufficient coal to steam from Cronstadt to Vladivostock at her most economical rate, or about 18,000 knots without the necessity of calling at a coaling station to replenish her bunkers. She has been built at the yard of the Baltic Works Company on the river Neva.

THE POTSDAM RED SANDSTONE COMPANY'S WATER WHEEL.

In a recent issue of this paper we illustrated the Potsdam stone quarries of this State. In one of the cuts a water wheel was shown, to which we alluded as employed for developing power for running the machinery of the works. This wheel was designed by a member of the firm of the Potsdam Red Sandstone Company. Its simplicity and efficiency entitle it to consideration, independent of the fact that the position in which it is placed involves special difficulties in operation. The river on which it is located is subject to freshets and varies at times greatly in the level, in the spring sometimes rising 6 feet. The stream is also used for logging, 200,000 logs passing down it in a season. These sometimes jam, and quantities of the logs strike the wheel and pass under it, the wheel rising to let them pass. The wheel has been in operation for several years, yet in all this time it has never broken a paddle.

The wheel proper is an undershot wheel of the simplest possible construction. The hubs or flanges for carrying the arms are keyed to the shaft, as shown in the cut, Fig. 2. To further stiffen the shaft, three struts are placed equidistant around its center, over which tension rods with turn buckles are carried, as shown in this view and also in Fig. 3. The wheel is destitute of framing to take up twist. In place of such framing a wire rope is carried spirally half way around the wheel, just inside the paddles, to which it is fastened. This compels the end of the wheel next the gear to keep up with the other end. The rope is found to answer the purpose perfectly.

The shaft of the wheel is made of rock elm, and is 24 inches in diameter. At the ends it is trimmed down for journals, and over the portion thus reduced in thickness pieces of 15 inch iron pipe are driven. The outer portion thus treated forms a journal two feet long; the inner portion is 6½ feet long. The wheel is 18 feet in diameter and 41 feet long. The paddles are 20 inches wide and of the full length of the wheel, each being in one piece. The arms are of 4x7 inch water elm.

The wheel axle is carried on trunnion blocks made of timber 20 inches square. The trunnion blocks are suspended by ropes, which, passing over pulleys in a stationary frame rising above the top of the wheel, terminate in counterweights, thus supporting the weight of the wheel. Everything now is in condition to keep the wheel at the same level as regards the water, whether it rises or falls. In the large engraving the trunnion block and counterweighting arrangement for the outer end of the wheel shaft is shown. A similar mechanism is contained within the house for the other end of the shaft. In Fig. 4 of the sectional drawing the arrangement of counterweighting is shown more in detail.

The end of the shaft is carried into the house and on it a gear wheel 10 feet in diameter, with teeth of 2½ inches pitch, is placed. It is obvious that as the wheel rises and falls this gear wheel will, of course, do the same. The arrangement shown in Fig. 5 is for the purpose of enabling it, in spite of the changing of position, to operate a fixed countershaft. A wooden frame of heavy timber has one end journaled upon the shaft, so as to inclose within itself the 10 foot gear wheel. On the same frame a 10 inch gear wheel engaging with the larger one is journaled. This gear wheel turns a 5 foot band wheel attached to its own shaft. From the band wheel a belt goes to a fixed band wheel near the ceiling, which, by miter gearing, turns a grooved rope pulley for the power-transmission cable. On the further end of the frame a box is placed to receive material for proper counterweighting. This counterweight keeps the belt stretched. An examination of Fig. 5 of the cut will explain the entire arrangement. As the water wheel rises and falls, the counterweight executes the reverse movements. The 12 inch gear wheel and 5 foot band wheel change in position a little as these movements take place, but the counterweight keeps the belt always stretched, and the two gear wheels are always at a fixed distance from each other, as they are both attached to a rigid frame. The grooved sheave for the transmission rope is 10 feet in diameter, and normally runs at 200 revolutions per minute. The gear wheel on the end of the shaft is of wood with iron segments bolted on, and is of 8 inch face, as is also the 10 inch pinion with which it engages.

The fastest speed of the wheel is thirteen revolutions per minute, its lowest speed is six revolutions. It has developed as much as 200 horse power. The total expense, including pulleys, belting, shafting, and wire rope for transmission, was $2,500. The gear and all the parts have worked perfectly without noise or wear. It was built by regular employes of the Potsdam Red Sandstone Company.

Chemistry a Shrewd Detector of Forgery.

Some years ago a traveling salesman related to me a curious incident of detecting a forgery. He was a traveling salesman when emery wheels came into early use, and he sold a quite large wheel in Providence, R. I., and wrote them what speed it was warranted to run at safely. In a short time the party wrote to him that the wheel had burst and broken one man's arm and done other great damage. So when he went to their city he called at their place, and they sued him for some thousands of dollars' damage; and as he was out of his State it caused him no little trouble to secure bonds for appearance at court for trial of the case. This he did, however. Then he commenced to study how to get out of his trouble. He had been rather careless in not copying his letters, and this one in particular; but a happy thought struck him, and he went to their office and inquired what ink they used. They said Carter's exclusively. In looking at the letter he thought that the figure 1 in the 1,800 was of a slightly different shade than the 800, while the salesman used Arnold's only in his office. So in going home he went and saw a scientific chemist in New York City and paid him $25 to furnish a chemical solvent that would dissolve and remove either ink without affecting the other. So in about a month came to him, by express, two bottles, one marked to remove Carter's ink and the other to remove Arnold's, with directions how to apply and use it. He tested them, and both were a success.

The time for court came, and he appeared there with counsel. He heard the evidence of proprietor and bookkeeper. In cross-examination the bookkeeper swore that he used Carter's ink only. The salesman's letter was produced. The judge and foreman of the jury were called to a table to see an experiment in chemistry. Defendant had two bottles of ink and two bottles of solvent. The court was asked to write his name with the two inks on two pieces of paper and dry them thoroughly by the fire. Each solvent was tested; one removed the Carter ink and the other the Arnold. Then the letter was brought and the court asked to carefully examine the shades of ink, and thought it discovered a slight difference.

Then the solvents were applied, and the figure 1 completely removed without affecting the figures 800.

The court said, "It is not necessary to proceed in this case. The jury is instructed to bring in a verdict for defendant, with costs of prosecution." Said the salesman who related this to me, "I was not through with them then. I made them pay for that emery wheel, all of my costs and time, and my lawyer's fees, or risk a suit for forgery. They paid everything up and quit, and had a very costly emery wheel." J. E. EMERSON.

The Oil and Gas Region in Ohio.

Mr. John Gould, writing from Western Ohio to the *Country Gentleman*, gives the following interesting account of the oil and gas wells of that region:

That these black swamp lands of Ohio were the 1,200 feet covering of an oil stratum, and across the State from northeast to southwest was to be discovered a gas belt that would be a world's wonder, no one had ever dreamed of, and this discovery, a few years since, the mad rush of speculators, and the tide of adventurers who are also seeking their Eldorado, have had a wonderful effect upon the agriculture of the western counties of the State. The number of wells, both of gas and oil, that have been put down in Western Ohio is past computing, and as each one represents an outlay of from $2,000 to $5,000 for derrick, engine, housing, piping, and labor, some economists put the outlay at a figure actually above the income from the sale of the oil. It is also to be doubted if the farmers, except in individual instances, have had their actual wealth enhanced by the discovery of oil; not but that the farmers receive the money for the ground lease and royalty, but assuming that these wells would be a lasting source of income, hosts of these men have in turn become oil speculators and well developers, and the abandoned wells and dry holes tell why oil is not always a source of wealth or profitable investment.

A day of observation among the wells is not without interest, and may possibly awaken a moment's attention on the part of your readers. These wells are usually in clusters, varying in number from six to a hundred, and as a rule are not far from 1,200 feet in depth. The huge derricks above them are not far from 60 feet in height, resembling a windmill tower. The wells are cased below the water line with a 5 inch iron tubing; inside this are the 2 inch pump tubes. The well is provided with a small engine, although the steam is furnished from a central boiler house that supplies the power for from three to eight wells. The steam pipe to the wells, that may be 10 or 150 rods away, is put in a 6 inch square wooden conduit box, elevated about two feet from the ground. From each well a return half inch gaspipe is carried to the furnaces of the boilers, so that no fuel but gas is used. Nearly all the wells produce a little gas, which is thus utilized, making a steady, uniform fire; and besides, this plan enables the engineer not only to manage the boiler house, but also to look after all the wells connected with it.

The wells vary greatly in productiveness, and that a well is a good producer is no sign that another, six rods away, will be worth pumping, or that the lasting qualities of one well give any assurance that its neighbor will last beyond the time required to pump its "head" off. The oil in this region seems to be found in "pockets," that underlie tracts of land from a few acres to whole sections and the greater part of a township. The county has been all drilled over by the prospectors, and derrick ruins in every direction attest that it costs money to find money, and that fortunes are lost quite as often as found.

The oil product has greatly lessened, and, with few exceptions, a 30 barrel well is now counted a good one, though a well is pumped until it gets down to a one or two "barreler," when it is "shot," and then if the flow is not increased, the derrick is taken down, the pumps taken up, and the casing drawn with powerful "jacks," the hole plugged, and our farmer's source of royalty is at an end, unless he has a number of wells upon his farm. Many farmers will lease only a few acres to a company, and so may have two or even three oil companies producing upon his farm. When a good well is struck, the aim of other companies is to lease up as close to the well as possible, and put down wells all about it and thus assist in pumping out a territory as soon as steam pumps will elevate it, to prevent the other man or company from making a "mint." These rival wells are not always a success, and a poor well beside a good one is not a rare thing.

Farmers are paid a pretty uniform price of $2 per acre ground lease and one-sixth of all the oil pumped, and those who were thus content, and wisely used their royalties, and kept right on farming, have reason to congratulate themselves, while others are softly repeating the old refrain, "It might have been" otherwise.

Each and all of these wells are connected with the Buckeye pipe line, and the oil is first pumped into a tank at the well. At certain times the pipe line companies' agent visits the well, measures the oil in the tank, gives a "scrip" for it, and connection is made with the main line, for all wells have a small pipe to the main pipe, that is operated by large pumping engines, with compound pumps, that have a capacity of forcing from 5,000 to 15,000 barrels of oil through the lines in 24 hours, and these mains are connected with the lines of the Standard Oil Company, that extend to Chicago, Buffalo, Cleveland, and New York City, so that when the oil leaves a well tank there is no knowing where it may be four days after. The man who takes the pipe line oil receipt, or scrip, takes it to the pipe line company, who cash it at the going price of oil —now 43 cents—or sells it to an oil broker, and it quickly becomes a factor in the oil exchange, to bull and bear the oil market.

The "shooting" of a well is an interesting operation. The pumps are pulled up, long 3 inch tin cans of nitroglycerine are carefully let down to the bottom of the well, often 100 quarts in all, and then a little iron go-devil is dropped down into the well, which, striking the top can, explodes it, and all the rest for that matter. There is a faint explosion heard, the earth gives a pulsation, and oil and gas may as a result spurt into the air in a column or it may not, and the well may freshen up or it may prove permanently dry, in which event the derrick is torn down and the well pulled up.

The gas fields are dotted here and there through the oil territory, though both are often found in paying quantities close together, but great as was the amount of gas and so wasteful were its discoverers that probably not over one-fourth of the gas once found can be coaxed from the ground at present, and where gas was used not only to light and warm buildings and furnish fuel for all kinds of manufacturing purposes, so low has the pressure become that wood, coal, and coal oil are now in active demand by a majority of those who once used it almost exclusively.

The Magnesium Light.

The application of powdered magnesium as a source of light for photographic purposes is by no means such a modern invention as some seem to suppose. So far back as 1865 it was used; and in that year Mr. H. Larkin obtained a patent for a lamp for its combustion. The lamp answered well, and we were present when some very good portraits were taken by its aid. In this lamp the powder, mixed with a certain proportion of fine sand, was made to pass through the flame of a spirit lamp, or one of gas, which insured its combustion. The chief reason why the lamp was not much used was the then prohibitive price of magnesium.—*Br. Jour.*

A LASTING machine that enables one operator to last 3,000 pairs of shoes a week is one of the latest things in labor saving machinery. It tackles anything from light feminine foot gear to the heaviest brogans.

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Correspondence.

Dangers of Celluloid.

To the Editor of the Scientific American:

Not long ago the third story of a residence in my neighborhood was burned out. One of the ladies of the family washed some toilet brushes and placed them upon a cushion in front of the hot air register, then left the room. One of the brushes had a celluloid back, and the cause of the fire was the explosion or ignition of this. I. HARMANUS FISHER.

Baltimore.

Streets in Hamburg.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of December 17, 1892, you give the pictures of three of the streets of Hamburg, which are incorrect in being called "streets." The streets which you are naming are as wide as any streets can be. For example, the Steinstrasse is as wide as Broadway (and perhaps wider), the Niederstrasse is as wide as any of your other side streets, and the Neustadter Neustrasse is as wide as your Five Points.

The numbers given to your illustrations indicate that they mean not the street itself, but simply the number of a house.

The numbers given your illustrations are the current numbers in the street, and here are the entrances to the back tenements. The front building on the street is generally a brick house. Under this house is the entrance or alleyway leading to this row of tenements, and though this alleyway entrance is often so narrow that only one person can pass, when you pass through the front house, the alley called "Hof" is wider, so that four to six or eight persons or more can walk abreast. That the windows when opened will touch one the other or that the people in this tenement can shake hands is simple nonsense. It is true these tenements are cholera traps, but they are not named streets as given in your illustrations. In the new city streets you will find nothing better. There all is fine and clean. DR. L. HOLTZ.

Photographing Magnetic Curves.

To the Editor of the Scientific American:

Two articles on the "Photographing of Magnetic Curves" have appeared in recent publications. One, by C. B. Thwing, of the Northwestern University, appeared in the *American Journal of Science* of November, 1892. The other, by E. J. Houston, of the Philadelphia High School, appeared in the *Electrical Engineer* of July 20, 1892. Curiously enough, both investigators independently hit upon the same method.

A gelatine dry plate is placed horizontally over the magnet under investigation. Iron filings are distributed over the plate. These arrange themselves in the direction of the lines of force, reproducing the familiar magnetic curve map. By a short exposure to a source of light the image is impressed on the plate, which after removal of the filings is developed. The negative thus produced is used for making lantern slides or photographs *ad libitum*. What is almost the same method was described a number of years ago. In the *Electrician and Electrical Review* of this city, of June, 1884, on page 131, A. D. Stevens, of Worcester, Mass., describes the use of blue print paper for mapping curves. He emphasizes the importance of having the light rays used for the exposure normal to the surface.

As a variation on the above methods, excellent magnetic curve maps may be produced with bromide paper. A lighted match gives ample light. On development a white map on a black ground is produced.

It is essential in these direct photographic methods to give the exposure without moving the plate. Bromide paper in one way is a little better than glass plates, as it brings the plane of the map nearer to the poles. The use of celluloid or gelatine films would effect the same result, if held in a frame so as to lie flat.

New York, N. Y. T. O'CONOR SLOANE.

Frost on Window Panes.

To the Editor of the Scientific American:

Sitting at a window in the second story of the Union depot, in Kansas City, on the evening of December 14, my attention was called to a phenomenon of more than passing interest. Opposite the window was an arc lamp, by the light of which I could see against the window frame what seemed to be currents of heat. The temperature of the room was, I think, about 60°, while outside it was about 25°. I watched these currents for several minutes, but having to take train in a short time, I could not continue the observation sufficiently long to reach a definite conclusion as to what would be the result of their presence, but sufficient time was had to note some interesting points. The currents were mostly upward, often transverse, but never directly downward, except when a miniature cyclone would come, when every direction was taken. The particular point of interest was that the currents moved in threads, and that they crossed one another at every angle, always following the strictest order in their individual movements. Even when the utmost confusion prevailed, as when a "cyclone" would come, every movement was made under law, and as a result remarkable figures were seen, crystals of all kinds, clouds and trees, yet these were seen but a moment. It occurred to me, however, that their delicate tracings possibly remained and that each succeeding storm added thereto until the figures, by the morning of the following day, were strikingly prominent. I was not there on the following morning, but it is probable that, had I been there, I would have seen a beautifully frosted window. N. T. ALLISON.

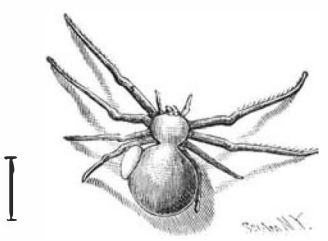
[The phenomenon above described is the usual effect of the reflection or refraction of the intense rays of the arc light from condensing moisture and frost upon glass. The apparent movement or coruscation of light streamers was due to the lachrymal flow over the cornea of the eye, which flows in waves, and under the irritating influence of the situation no doubt produced the apparent cyclones, storms, clouds and trees, flitting across the optic nerves of our correspondent.]

Instinct and Intelligence of Insects.

To the Editor of the Scientific American:

Mr. Mivart, the great naturalist, in an article in the *Cosmopolitan Magazine*, notes that a certain sand wasp of his island, after she had concealed her nest by covering, was able to return to it very directly; but if it were uncovered for her by some one else, she was not able to recognize it at all. She seemed to have no conception of it by sight. *Apropos* of this, a subsequent observation on our common mud wasp may not be uninteresting.

Over one of my parlor windows the slatted blinds are almost constantly closed. Behind these I heard the industrious hum of one of these creatures, and on opening the left leaf I exposed her to a strong light, which did not seem to disconcert her. In a few minutes she flew away for a new mud ball. But on her return, although her nest was stuck against the red sash, in strong contrast, in plain sight, she seemed unable to recognize it. She had been approaching it at a point



where the movable slats were tilted downward (when closed); but of course, now that the blind was open, these all inclined upward. On the other leaf, however, though much lower down, were some slats tilted much as the others had been, and through these she made repeated entrances, only to crawl out into the open light some distance from her nest, though she always started in the same relative direction that it lay from the other slats when in place. She was evidently much confused and distressed. She would fly out a little further each time, seeming to think that she had not made the right approach, sometimes going out from under the porch and returning. At last she dropped her pellet and began a crawling investigation, passing often within a few inches of the unfinished cell, but appearing to have never seen it. After much of this she went away and came no more that evening, for it was getting dark.

I failed to think of the incident for a few days, and some one closed the blind in the meantime, so that when I again examined it the single cell was completed and sealed. On breaking it open I found within a small greenish-white spider, on the side of which was glued the single egg. I send you a shadow photograph showing, in exact size, the relative positions. Of course, most of your readers know that it was the mother's provision for the young larva when it should hatch out. I might add that the spider showed the usual signs of life in a cataleptic state, showing the wonderful instinct that enabled the wasp to sting it at just the right point and to the proper extent to allow life enough to remain to preserve it fit for food, while it was dead to all efforts at resistance or escape. Mr. Mivart stresses this contrast between the want of *intelligence*, in being unable to approach its nest by any route but one (and exhibiting such a small amount of reasoning power), and the *instinct* that makes it so skillful in its providence and foresight. To his mind it argues a wide breach between intelligence and instinct. JAMES NEWTON BASKETT.

Mexico, Mo.

Cat-tail Flags.

To the Editor of the Scientific American:

In the inlets and caves on the east shore of the Connecticut River grows a flag or rush that has a high market value, and which is gathered and cured each year by a class of men who have followed the business for many years.

This flag is commonly known as the cat-tail. At the top of a tall, straight stalk that grows out of the center of the cluster of flags a blossom is found that is dark brown in color, about 2 inches in diameter and 6 inches long. When dry, these blossoms are tied together in bunches with ribbons and fastened to the walls of houses as ornaments.

The flags grow to a height of six feet, and taper to a point at the top. In June the harvest begins and continues until August. They are cut with sickles, about three feet from the ground, and very carefully spread out on the stubble to "cure."

They are allowed to lie on the stubble a week, during the greater part of which time the tops of the flags are covered with hay to prevent them from drying too quickly, in which case they become too brittle for practical purposes. The object of the flagman is to get the moisture out of the rush in such a way as to render it tough and pliable when ready for the market.

At the end of the week the flags are taken off the stubble and stacked on end. The stacks are built on sandy soil, in order that the moisture in them may be slowly drawn downward and absorbed by the earth.

The flags are allowed to stand thus stacked for three weeks and longer, if necessary, to get sufficient sunshine to cure them properly; then they are removed to sheds, where they are allowed to stand, so arranged that the air will circulate among them.

Great care has to be taken that the flags do not mildew or rot. In either case they are useless. To prevent this, they are removed from the sheds as often as every three weeks and carefully assorted. The flags in this operation are handled separately, and much time is consumed by it. It is often the case that flags are not ready for the market until a year after they are cut.

When ready for the market, the flags are tied into small bundles, and in that form are shipped. The flags along the Connecticut River are considered the best that are found, for the reason that they grow in brackish water. If the water is too salt the flag grows rank and brittle. The spring freshets in the Connecticut River are of great benefit to flags.

They are cut but once in two years, and though flags of a first-class quality are taken from a certain marsh this year, they may not be as good there again in ten years, in consequence of the different condition of the water that floods that particular plat.

From ten to fifteen tons of these flags are harvested a year and sold in New York and Boston, at an average of twenty-five cents a bundle.

Years ago the rush was used to lay between the staves of molasses barrels to prevent their leaking; but of late they are employed in the manufacture of hotel chairs and pieces of rush bottom furniture, that has become quite a "fad" in private residences.

In the factory the flags are prepared carefully and by hand. They are rendered pliable by steam, and each rush is drawn between the thumb of the workman and a stick that he holds in his hand, for the purpose of removing the air from it. When ready to be woven it is very pliable and tough.

THOMAS HOLMES.

World's Fair Notes.

The American flag now floats from the Administration Building at Jackson Park to signify that the World's Fair buildings and grounds are in the possession of the United States government. Vice-President Morton accepted them on behalf of the government on dedication day, but actual possession was not taken until Director-General Davis, the chief government World's Fair official, moved into his offices in the Administration Building. The raising of the stars and stripes signaled that event.

All of the World's Fair offices, except two or three, are now removed to Jackson Park, and those will soon follow.

The installation of exhibits has already begun, but has not yet progressed far. Soon, however, the interior of each one of the buildings will be the scene of great activity. The authorities are determined to have all exhibits in place at the opening of the Fair, and manifestly this cannot be accomplished if exhibitors are allowed to be dilatory. It will not do to permit the great mass of exhibitors to defer installing their exhibits until April, and accordingly State and foreign commissions and individual exhibitors will be required to be prompt. Exhibitors who are dilatory beyond a certain point will lose their space and be barred out.

The requirements of the preparation of the official catalogue of exhibits also necessitate promptness on the part of the exhibitors. This catalogue will be an elaborate publication, and, generally speaking, will have a separate volume devoted to each department.

The section from one of the big California redwood trees, which the government will exhibit in its building at the World's Fair, has arrived at the Fair grounds. Eleven freight cars were required to convey it across the continent. It measures 30 feet long by 23 feet in diameter. The section is hollowed out, and when placed on end, divided into two stories and lighted, as it will be, it will form a rustic house large enough for a family to live in.

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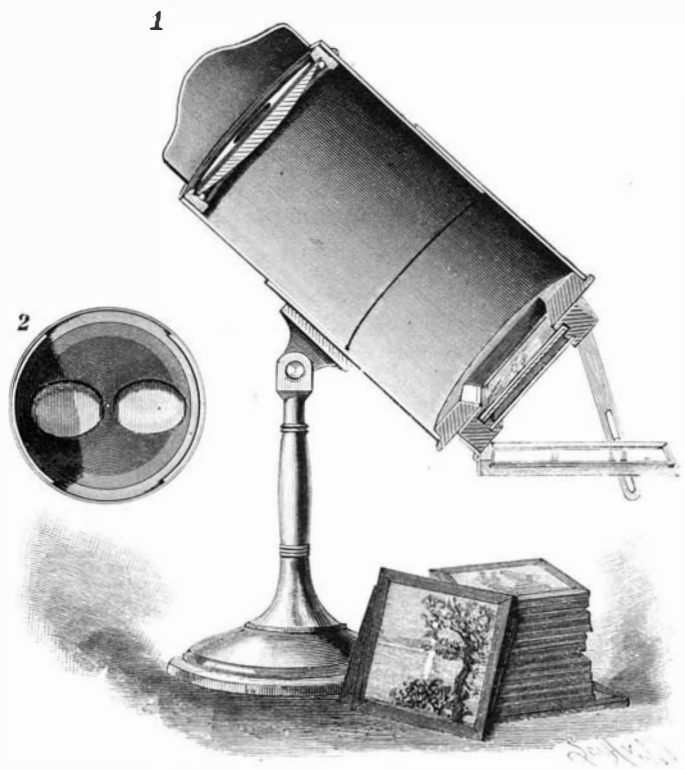
INSTRUMENT FOR VIEWING LANTERN SLIDES.

BY GEO. M. HOPKINS.

The photographer or lanternist who has a large accumulation of slides loses much of the pleasure and profit of his collection unless he is provided with an instrument of some kind for viewing the pictures directly, without the use of a lantern. Several instruments of this character have been devised, most of which admit of the use of only one eye, thus making the examination of the views tiresome and unsatisfactory.



INSTRUMENT FOR VIEWING LANTERN SLIDES.

The annexed engraving shows a very convenient instrument for this purpose, in which both eyes are used, giving an effect which is almost stereoscopic. The instrument, which is shown in section, consists of two tin tubes sliding one within the other telescopically, and mounted adjustably on a standard. The lower end of the tube is provided with two grooved guides similar to those used in the lantern for receiving slides. In the outer guide is placed a piece of fine ground glass, and the slides are inserted in the inner guide. Below the ground glass is hinged a reflector for throwing the light through the ground glass and slide. To the upper end of the telescopic tube is fitted a wooden ring in which is placed a plano-convex lens, with the plane side out. It is of sufficient diameter to admit of the use of both eyes in viewing the slide, and has a convenient focal length. Over the glass is placed a screen of black paper, with two apertures of about the size and shape of the lenses of an eyeglass, see Fig. 2, and around the opening in which the lens is placed is arranged a hood for screening off extraneous light. The diameter of the plano-convex lens is 4½ in. and its focal length is 15 in.; the telescopic tube is 5 in. in diameter, and when extended for use has a length of 10 to 12 in.

By thus placing the plane side of the lens out, and arranging the slide within the focus of the lens, the spherical aberration is almost overcome, and both eyes are enabled to view the picture. The effect is very satisfactory, and as the view is considerably enlarged, at the same time being seen with both eyes at short range, the picture appears practically stereoscopic. With daylight only the plane mirror is required for proper illumination when the light comes from the sky or some plain light colored surface, but for lamp or gas light the lamp should have a plain porcelain or ground glass globe, or a piece of smooth white paper should be laid over the mirror to furnish light of the character required.

NEARLY 2,000 electric cars are running in the United States. Boston alone has about 100 miles of electrically operated roads. Several systems have been developed to a perfection that insures smooth and regular service. Other systems are still in the experimental stage.

FIREWORKS IN MINIATURE.

To set off this piece of fireworks it is not necessary to be a pyrotechnist. Provide yourself simply with a blowpipe or even a clay tobacco pipe. Take a few sheets of thin tinfoil, such as is used as a wrapping for chocolate, and cut them into strips of a width of about an inch. Then present each slip to the flame of the blowpipe, when the metal will ignite and fall in incandescent globules, which will rebound and run over the table on which you operate and travel to a considerable distance. Sometimes they will divide and give rise to other globules that will run and leap in all directions.

When the flame is strong and the tinfoil burns briskly, the globules are very abundant and then present the aspect of a bouquet of fireworks in miniature.

There is absolutely no danger attending this experiment. The globules, surrounded with oxide formed during the combustion, leave only a small whitish track that may be quickly removed, even from oil cloth.

This combustion, which produces a curious effect, is at the same time a demonstration of the combination of a metal with the oxygen of the air. By such combination, the tinfoil is converted into a white oxide. It was by studying the increase in weight exhibited by tin heated in contact with the air that John Rey, a chemist of the seventeenth century, succeeded in understanding the fixation of the air upon metals.—*La Nature.*

COMBUSTION OF TINFOIL IN THE FLAME OF A BLOWPIPE.

A NEW ELEVATED ELECTRIC RAILWAY SYSTEM.

BY HENRY S. PRUYN.

A new elevated electric railway system, known as the Pruynway, is shown in the accompanying illustrations. The picture at the left gives a perspective view of the structure of the girder and of the rail which it carries on top of it and the two current conductors carried under the lower flanges, where they are not only insulated, but protected from damage by the weather or any other cause. Slightly below the level of these power current conductors, and between them and below the structure, is a space for telegraph, telephone, light or any other electric lines, which are also protected from interruption by snow, ice or other causes. As these conductors are firmly fastened and completely protected, there is no danger of short circuiting or leakage of any of the current.

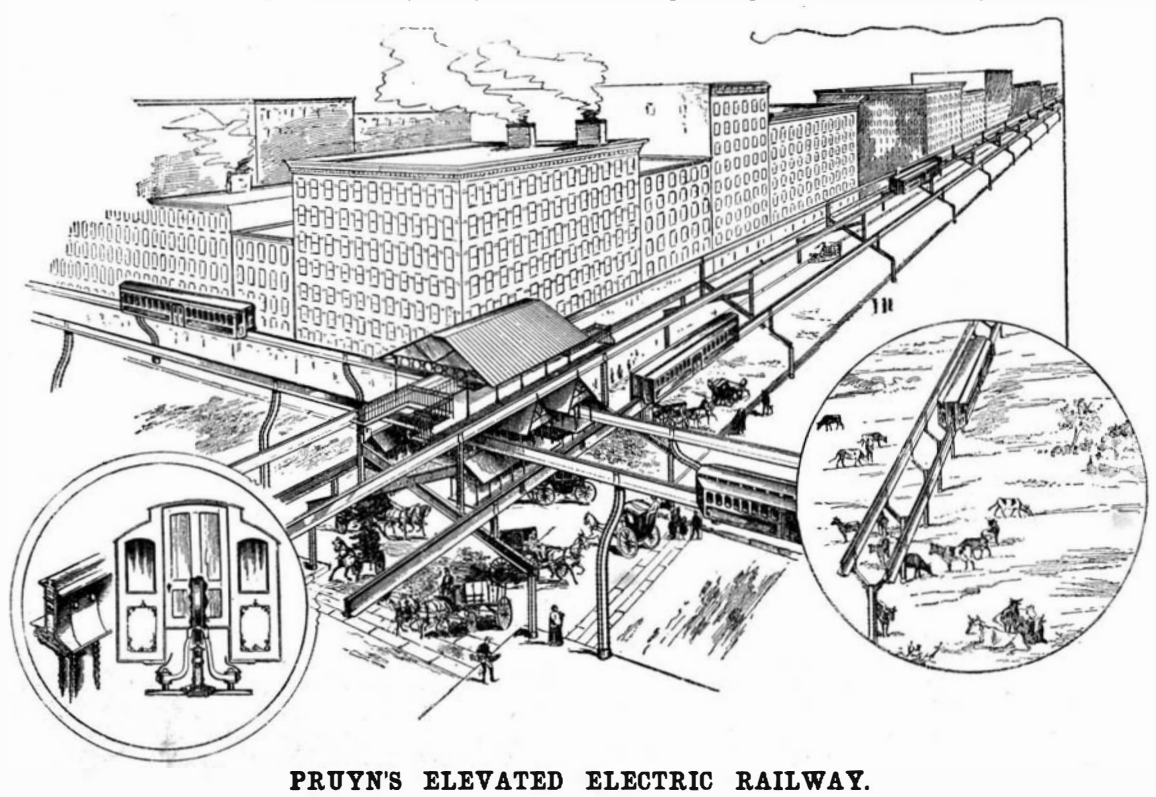
The track and its structure stand on posts high enough to permit free passage for the public below, and to prevent all interference. Freedom from obstruction by snow is secured, even in the most snowy regions; and the drifting of snow and cleaning it away from tracks on city streets is a serious nuisance which this system entirely escapes. In fact, no obstructions of any kind, intentional or accidental, are liable to occur.

In the Pruyn method of operating the electric power and current, the system does not depend upon the ordinary ground circuit. Instead of the return current being allowed to pass through the structure to the ground, it is passed from generators stationed at suitable intervals along or under the railway line, out through the conductor at one side of the structure, and picked up and carried by a suitable truck conductor to the car motor, and after having performed its allotted labor in driving the carrying wheel which rests on the top of the main rail, passes down on the other side of the car through a suitable conductor into the opposite guide wheel below, which delivers it to the current conductor on that side and returns it to the original generating dynamo.

Each car is self-propelling and the cars may be run singly or in trains. The weight of the car and its load is carried low on either side of the track rail, and largely below.

Doors for the use of passengers are provided in the sides of the car. Passengers sit comfortably, back to back, separated by a narrow aisle or passageway for the use of the motorneer, and facing the sides of the car.

The view in the right hand panel will give an idea of the Pruyn method of construction for a cross-country, double track road. A right of way one rod wide is sufficient for it. There are no grade crossings for wagon roads, footpaths or railways, and thus no liability of damage to persons or property from passing trains, smoke or accidental fires from locomotive sparks. The Pruynway needs no grading, ballasting, draining, culverts, fencing, telegraph posts, cattle guards or small bridges; no bridges are required except over large streams and ravines. The Pruyn road passes over bridges without obstructing footpaths and roadways; and as the electric current which propels the car is broken on drawbridges by the opening of the draw, the cars cannot run upon a drawbridge or approach it while the draw is open. The line can run through agricultural lands with no more interference with tillage and grazing than would be occasioned by a series of trees standing several rods apart.



PRUYN'S ELEVATED ELECTRIC RAILWAY.

Cars and trains can be run at a speed limited only by the rate at which the driving wheels can be rotated by the heavy electrical current, without the necessity of stopping for supplies of water and fuel, for re-oiling journals or changing engines, and can be run without danger or inconvenience within or without, at full speed, through the most densely populated towns as well as anywhere else.

The central view shows the system as applied in cities, with a three-story station at the intersection of two streets, for the accommodation of passengers on either of the three lines of railway shown. Through express cars run on the two highest tracks of the main line; local accommodation cars run on the lowest pair of tracks, nearly over the curbs on each side of the street.

The structure is a *permanent way*. Once made, it is there for years. It does not require the expenditure necessary in ordinary railroads to keep in repair their 2,500 ties and 350 rail joints to the mile on a track bed exposed to the action of rain, frost and other effects of the weather.

The cars are lighted and can be heated by electricity under instant control, without danger from fire or steam under any circumstances; from the breakage of

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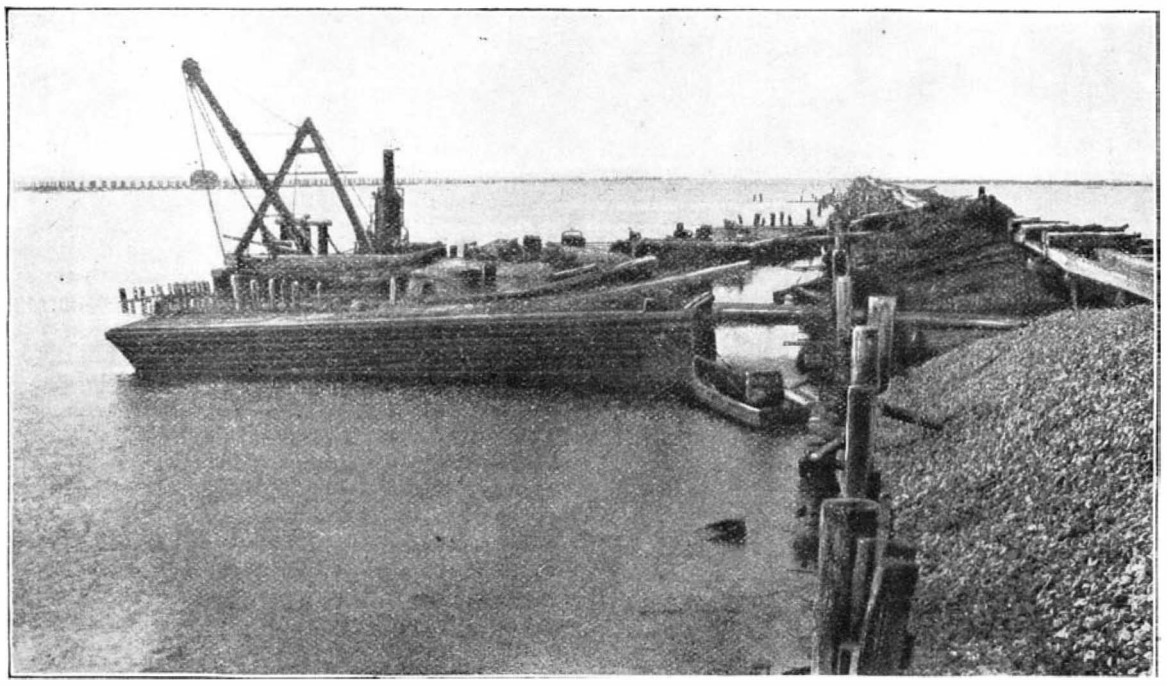
trucks, should such a thing be possible, as the remaining truck suffices to retain the car locked on the track until it stops, and then continues to hold it there. At each truck safety rollers are provided which would take its place in such an emergency in sustaining and guiding the car at that end and keeping it in position.—*Electrical Review.*

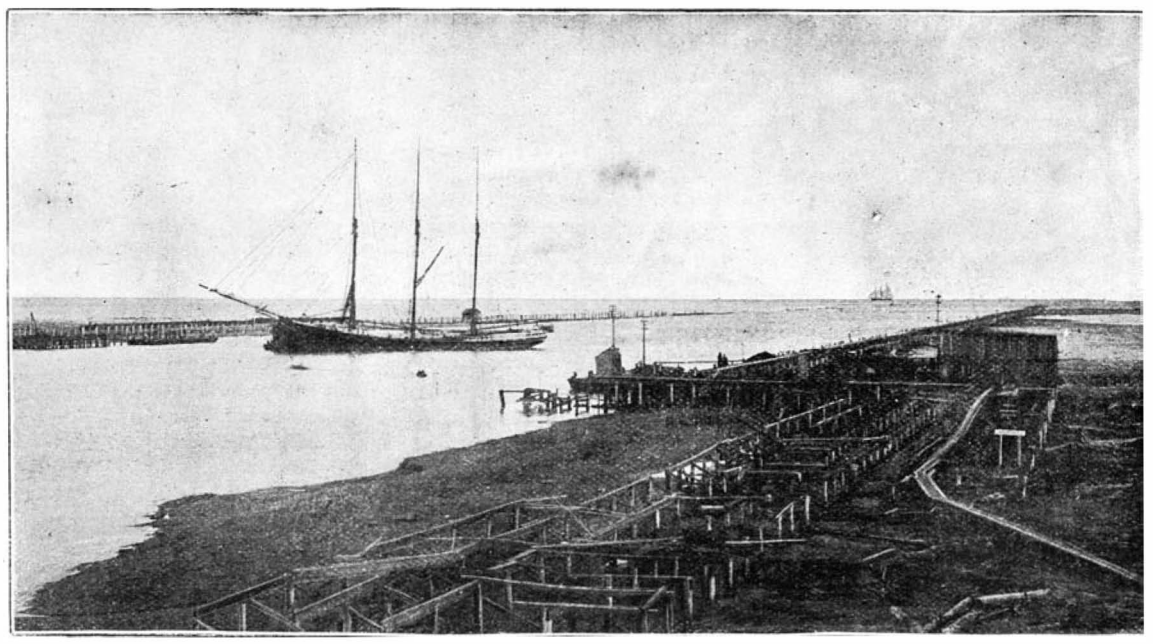
THE GREAT JETTIES AT THE MOUTH OF THE BRAZOS RIVER.

WALFRED W. WILSON.

There are being built at the mouth of the Brazos River, on the gulf coast of Texas, two massive jetties, the object of which is to scour out and maintain a depth of 20 feet of water over the bar. This work is being carried on by a private corporation, at a cost of $850,000, and is now almost finished. The jetties are 5,400 feet in length and 560 feet apart. They start from the shore line and extend out to and end upon the outer slope or over the bar. The mode of construction is as follows: Wharves are first built at the shore end of the jetties. Brush mattresses are then placed between the piles of these wharves and loaded with stone so as to form substantial headings from which to build the jetties seaward. The mattress work is constructed from a trestle of four rows of piling for each jetty. The mattress strips are made continuous by splicing, and the lower mattresses are supported by timbers suspended from the trestles. Brush is first piled crosswise, then lengthwise, and then crosswise again, sufficient that when compressed the mattress is from two to three feet thick and 250 feet in length. The strips are placed five feet apart and are connected by galvanized wire rope. A compression strain of one ton is given the binders at each connection. The upper strips of the lower mattress are used for the lower strips of the upper mattress, and



so on until sufficient thickness is obtained, that when firmly forced on the gulf bottom the top of the jetty will be about two feet above the flow of the average flood tide. The jetty is then loaded with stone and concrete to thoroughly consolidate it. The interstices of the brush work are filled with sufficient rock to give the jetty a weight of 75 pounds per cubic foot displacement. The jetties are parallel to each other, so that the forces at command are applied uniformly throughout the whole length of the channel. The axis of the jetties are at right angles to the deep water curves in the gulf, and the end of the east jetty extends beyond the end of the west jetty, thus protecting it and the channel entrance from heavy seas and drifting sands. The work is carried on by means of a double railroad track extending seaward as the jetties progress, and the brush mattresses are hauled upon tilting ways placed upon a platform car, while the piles are driven by an overhanging driver. The mattresses are launched between the piles and loaded with sufficient stone to hold them in place. A platform is arranged under the tilting ways, on which the necessary amount of stone is carried, and from which it is thrown on the mattress as soon as it is afloat and made fast to the piles. When the sea will permit foundation mattresses are floated ahead, anchored in position by anchors or temporary guide piles and loaded with stone from flat boats. The sea end of the jetties will be provided with solid pier heads built of heavy blocks of stone and concrete to withstand the terrific wave force which at times nothing but the heaviest construction, with suitable slopes, can stand. Mr. E. L. Corthell, of Chicago, Ill., is the chief engineer and Mr. George Y. Wisner, of Velasco, Texas, is the resident engineer. The Brazos River is 800 miles long and drains an area of 36,000 square miles. It debouches boldly into the Gulf of Mexico in one solid stream, there being no delta formation at its mouth. The current of this great river will rush through the channel made by the jetties, scour away the sand and mud, and thus carry out the design of the engineer by acquiring and maintaining a depth of 20 feet of water over the bar.



JETTY WORKS, BRAZOS RIVER, TEXAS.

The Eye and the Telescope.

The following careful statement by Prof. E. S. Holden on the power of the eye and the telescope, as they are contrasted in actual experience, is of special and permanent interest:

If the brightness of a star seen with the eye alone is one, with a two inch telescope it is one hundred times as bright; with a four inch telescope it is four hundred times as bright; eight inch telescope it is sixteen hundred times as bright; sixteen inch telescope it is 6,400 times as bright; thirty-two inch telescope it is 25,600 times as bright; thirty-six inch telescope it is 32,400 times as bright. That is, stars can be seen with the thirty-six inch telescope which are 30,000 times fainter than the faintest stars visible to the naked eye. While the magnifying power which can be successfully used on a five inch telescope is not above four hundred, the thirty-six inch telescope will permit a magnifying power of more than two thousand diameters on suitable objects, stars, for example. This power cannot be used on the moon and planets with real advantage for many reasons, but probably a power of one thousand or fifteen hundred will be the maximum. The moon will thus appear under the same conditions as if it were to be viewed by the naked eye at a distance of say two hundred miles. This is the same as saying that objects about three hundred feet square can be recognized. So that no village or great canal or even large edifices can be built on the moon without our knowledge. Highly organized life on the moon will make itself known in this indirect way, if it exists. If one were looking at the earth under the same conditions, the great works of hydraulic mining or the great operations on Dakota farms or California ranches would be obvious.—*Worthington's Magazine.*

Defects in Tin-lined Tubes.

Some brass condenser tubes in the United States cruiser Baltimore, after being in service for a year or more, were found to have experienced a peculiar change. In many places the metal was changed to almost pure copper, of a spongy texture, the zinc having completely disappeared. An investigation showed the probable cause of the failure to have been an electrolytic action between the tin lining of the tubes and the brass, the sea water circulating through the condenser forming the electrolyte. Had the tin coating remained perfect, no corrosion would have resulted; but the mud and grit carried in suspension through the condenser cut away the tin coating in spots, and it was at these spots that the change of the metal occurred. It was concluded that if the tubes had not been tinned at all, they would have remained intact.

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Decisions Relating to Patents.

PATENTABILITY—ANTICIPATION.

In letters patent No. 367,484, issued August 2, 1887, to Jeremiah M. Watson, claim 1 is for a machine for compressing shank stiffeners, having "two rotating die or compressing rollers, the meeting faces of which are formed to present a recess, having one straight and one curved face or side, to thereby curve transversely one face of the stiffener," etc. Claim 6 is for a method of finishing the edges of shank stiffeners, consisting "in cutting out a blank from a sheet of material, leaving the same with beveled edges and obtuse angled corners, and thereafter passing the same between rolls having dies with rounded edges or margins in order to round the obtuse angles and beveled portions as cut." The Circuit Court of Appeals decides that the patent was not anticipated by either the "calendering process machine," of the American Shoe Shank Company, or the Blake or Tripp machines. 1.

Letters patent No. 188,079, issued March 6, 1877, to Henry W. Smith, for an improvement in sheet metal roofing, comprises a means for making a water-tight joint, and for securing the sheets firmly to the roof boards by means of an anchor piece of sheet metal, rectangular in form and bent at right angles, so that when one part is nailed to the roof the other stands upright. The adjoining sheets of roofing have upright flanges of unequal height, the anchor piece being between them. The vertical portion of the anchor piece is split centrally, and one leg is folded down over the shorter flange. On the higher flange a hem is turned down so as to embrace the top of the other leg, and then these parts are folded down over the shorter flange and anchor piece, thus completing a joint of six or seven thicknesses of metal, All these elements are old, and the claim is for a combination. It is held by the Circuit Court that the patent is valid, and not anticipated by the Boesch or the Diehl patents (No. 2,850, issued March 12, 1842, and No. 99,656, issued February 8, 1870), both of which, while resembling it in the split anchor and flanges of unequal height, require the folding of several thicknesses of metal at once; or by the Trissler and Stewart patent (No. 15,988, issued October 28, 1856), which has a solid anchor with a scroll, which fits into a similar scroll in the upper flange, while the scroll of the lower flange is inserted thereunder, thus forming a tubular joint. 2.

The Circuit Court holds that letters patent No. 205,816, issued July 9, 1878, to Henry Tibbe, claiming "a smoking pipe made of corncob, in which the interstices are filled with a plastic, self-hardening cement," were not anticipated, although prior to the application the bowls of corncob pipes had been varnished with shellac, unmixed with other substances, and plaster of Paris had been used to fill small cavities or cracks occasionally found in the cob. 3.

UTILITY.

In the same case the court rules that letters patent No. 205,816, issued July 9, 1878, to Henry Tibbe, claiming "a smoking pipe made of corncob in which the interstices are filled with a plastic, self-hardening cement," must be interpreted as for corncob pipe in which the exterior interstices of the cob are filled with a self-hardening cement; and though the invention is not of a high order, yet, in view of the generally recognized merit of the article, the patent is valid. 4.

EXTENT OF CLAIM.

In letters patent No. 230,590, issued July 27, 1886, to George F. Pinkham, as assignee of Jacob P. Tirrell, the claim is for, "in an electric lighting gas burner, a magnet for turning the gas cock by one electric impulse, combined with a fixed electrode, a', and a movable electrode, c', normally in contact, and mechanism connecting the armature with the movable electrode, to break the contact between a' and c' the instant after the gas is turned on, and create a spark for ignition, substantially as described." In the drawings, a' designated a platinum point on the fixed arm, and c' a small bent arm normally in contact with the fixed electrode. The Circuit Court of Appeals decides that the word "electrode" generally, and especially as used in the patent, means the platinum or other metal points constituting the poles of the circuit. 5.

ASSIGNMENT.

Letters patent were granted for a new improvement in school desks. The patentees formed a copartnership for its manufacture and sale, which, becoming involved in debt, was dissolved. The plant and manufactory were transferred to one of the firm, who agreed to carry on the business and pay off the indebtedness, and relieve the other member from all liability for the firm's debts. A deed for the plant was executed by the retiring member and placed in escrow, to be delivered on the performance of the condition. There was no mention of the letters patent in the deed or agreement. The Circuit Court lays it down that the right to manufacture and sell the patented improvement continued so long as the condition was complied with, and the custodian of the deed had a right to deliver it upon full performance of the condition. 6.

The purchaser of a patent right cannot rescind the sale on the ground of false representations that the patent was valid, and did not interfere with any prior patent, where the contract of sale itself contains an express warranty to the same effect, and an engagement on the part of the grantor to defend at his own expense all suits for infringement. 7.

1. Watson *vs.* Stevens, 51 Federal Reporter, 757.
2. Canton Steel Roofing Co. *vs.* Kanneberg, 51 Federal Reporter, 599.
3. H. Tibbe & Son Mfg. Co. *vs.* Lamparter, 51 Federal Reporter, 763.
4. Same.
5. Hanzel *vs.* California Electrical Works, 51 Federal Reporter, 754.
6. Routh *vs.* Boyd, 51 Federal Reporter, 821.
7. Reeves *vs.* Corning, 51 Federal Reporter, 774.

Automatic Brakes.

Repeated experiments on the Western Railway of France, especially between Paris and Mantes, have shown that with the Westinghouse brake a train of a verage load running at 80 kilometers (53 miles) per hour is pulled up without disagreeable consequences in a distance of less than 150 meters (168 yards) even without the co-operation of the driver; that is to say, with the regulator open. These experiments were made in connection with a system devised by M. Laffas, engineer to the Compagnie l'Ouest, for preventing collisions and rendering derailments harmless; these two classes of accident being by far the most numerous, and also the most serious in their effects. The Laffas system is divided under the following three heads: (1) The trains protect themselves by closing behind them automatically all the open signals they encounter. (2) All the trains are pulled up automatically; that is to say, without the intervention of the driver, so soon as they pass a signal set at danger. And (3) Signals set at danger cannot be taken off until the danger ceases to exist. By way of solution to the above threefold problem, M. Laffas has designed three appliances. The first consists of a strong cast iron stop placed between the rails, pivoting in bearings attached to a sleeper, and placed in communication by cranks and rods with a hand lever for putting it on and taking it off, the gear being interlocked with that of the signal. When the signal is set to danger, the stop is made to rise between the rails, so as to be struck by a lever on the train for putting on the continuous brake, the last named action constituting the third part of the system. The second consists of a movable bar mounted on links, as in a parallel ruler, so as to rise above the rail when put in action, to be depressed by the wheel tire when passing over it. This bar is interlocked by rods and levers with both the signal and the stop, so that the former is set to danger and the latter raised for putting on the brakes, when the train passes those portions of the line where the bars are to be fixed; these bars being for the protection of places such as crossings, where two trains might otherwise come into collision.

PHOTOGRAPHIC NOTES.

Niepce, not Daguerre.—A proposal to erect a new monument to Daguerre in his native village of Brie-sur-Marne has moved M. Leon Vidal, the editor of *Le Moniteur*, to remark that, but for Niepce, there would have been no Daguerre—photographically speaking, of course. Niepce was really the inventor of photography. Daguerre contributed his brick to the edifice, no doubt; but it is often forgotten that, without Niepce, photography would not have been known, and that in that case Daguerre would not have been the inventor of the Daguerreotype. Niepce was the real father of photography. It is an error to suppose, also, that Daguerre discovered the development of the latent image, inasmuch as a latent image existed in the bitumen process, being developed by dissolution of the unaltered bitumen. Development of the image on silvered copper was a different species of reaction, upon which modern negative processes are based; and, without attempting to minimize the importance of this discovery of Daguerre, M. Vidal concludes by pointing out that he followed Niepce. M. Vidal does service in the cause of historical truth by once more insisting on the relative positions occupied by these two men in the field of photographic discovery. Undoubtedly a great deal of the credit which belongs to Niepce is often given to Daguerre.

Converting Blue Prints into Black Prints.—The *Revue de Chimie Industrielle* says that the prints should be first passed through water acidulated with nitric acid, and thence into—

Carbonate of soda	50 grammes.
Water	1 liter.

In this the picture is changed to an orange tone, when it is removed and placed in—

Gallic acid	50 grammes.
Water	1 liter.

Being subsequently washed in water acidulated with HCl.

Recovering Fogged Plates.—In order to render plates which have been accidentally fogged, or have by mistake received two exposures, or are known to have been over-exposed, in a fit condition to be used again, M. Rossignol recommends their immersion in a bath consisting of—

Bromine water	50 c. c.
Tincture of iodine	20 "
Distilled water	1 liter.

After immersion for two or three minutes the plate is washed and dried. M. Rossignol says that, if the plate has only been partially exposed, it should be exposed to lamplight in order to make the fog impression uniform.

An Intensifier for Gelatine Negatives.—In the *Deutsche Photographen Zeitung* M. Kirchoff gives the following formula for an intensifier. To a solution consisting of—

Bichloride of mercury	10 grammes.
Water	800 c. c.

Twenty-five grammes of iodide of potassium are added until the red precipitate is dissolved, one gramme of hypo being then introduced. For use, the solution is diluted with its own volume of water, and intensification is allowed to proceed until the shadows of the negative are of a yellowish-green. The intensification is not apparent until the negative is dry.

Printing on Silk and Other Fabrics.—*Apropos* of M. Villain's recently published method of photo-dyeing, Mons. A. D. Lavroff writes to the *Paris Photographe*, detailing his method of printing on silk, cotton, etc. He prepares the following mixture:

Tartaric acid	1 gramme.
Common sugar	10 grammes.
Boiling water	100 c. c.

This is boiled for a minute and 0·5 gramme of borax added, the mixture left for six hours, the clear liquid decanted, 4 grammes of common salt added, and the solution filtered. The fabric is coated with the solution, and when dry is sensitized, dried, printed, toned, etc., as usual.—*Br. Jour.*

Music as a Remedy.

The connection between music and medicine was discussed by Dr. J. G. Blackman at a recent meeting of the Portsmouth Literary and Scientific Society. The subject is one of interest, both from a social and professional standpoint. In this instance it was regarded by the lecturer mainly in its medical aspect, and was treated on similar lines to those with which readers of the *Lancet* are familiar. The physiological foundation of musical therapeutics was examined and described as consisting in the power exercised by harmony over the vaso-motor function. Most will acquiesce in this view, which is also corroborated by the experiments of Riegel on the blood pressure and heart action during the performance of music. It follows naturally that the ailments most likely to be benefited by this means are those in which nervous disorder plays a leading part. A number of cases illustrating this point were quoted at the meeting referred to, and we should probably include among these one in which reduction of temperature followed the administration of "a dose" of melody. The violin takes high rank as a vehicle of the soothing property, and the other instruments best adapted to the treatment of disease by musical sounds were in the lecturer's opinion the harp and the pianette (not the piano), with which a few well chosen voices might be advantageously combined.

Dr. Blackman does not consider it feasible as yet to apply the musical method as above described in private practice, though he looks forward to its employment in hospital work, a hall being established in London where the services of musicians trained for this particular branch of their art might be obtained.

While willing to admit the salutary effect of good music in many cases of nervous disease, we confess that an arrangement so elaborate does not seem to us to be called for by the exigences of illness or justified by the importance of its probable effect. In any case of serious mental or bodily disorder the mild suasion of sweet airs must hold an altogether secondary place in the plan of treatment, and such as could usually be well filled with far less elaborate preparation.—*Lancet.*

Prominent Atlantic Steamers.

The following table shows the dimensions and power of the principal vessels constructed for the transatlantic trade since the Great Eastern was built:

Name.	Date.	Length, feet.	Breadth, feet.	Horse power.
Great Eastern	1858	680	82	7,650
Britannic	1874	455	46	5,500
Arizona	1879	450	45	6,300
Servia	1881	515	52	10,300
Alaska	1881	500	50	10,500
City of Rome	1881	546	51	11,800
Aurania	1882	470	57	8,500
Oregon	1883	500	54	8,375
America	1884	432	51	7,354
Umbria	1884	501·5	57·2	14,321
Lahn	1887	465	49	9,500
City of Paris	1888	500	63	20,605
Augusta-Victoria	1889	480	56	14,110
Columbia	1889	480	56	13,680
Teutonic	1890	550	57·5	13,000
Normannia	1890	520	57·1-4	16,352
Spree	1890	485	52	13,000
Furst Bismarck	1891	502·5	57·5	16,412
Campania	1893	620	65·3	30,000

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Motive Power Resources of Maine.

A glance at the map of Maine reveals what seems at first sight a small inhabited streak of land bordering a much indented seacoast, and resting on this streak of land a huge wilderness covered with forests and lakes. This first impression is not altogether an incorrect one, for although the State has an area of 33,040 square miles, or only 385 square miles less than the total area of all the other New England States combined, it has a population distributed almost entirely along the seacoast, according to the census of 1890, of only 661,086, or less than the combined population of Boston, Worcester, Lowell, and Lynn.

It is not what Maine is but what Maine is to be that attracts the attention of the person who examines its wonderful surface and its untold and almost untouched wealth. The annual rainfall upon the area of this State, assumed at 42 inches, if accumulated to the depth of Lake Erie, would cover 871 square miles. In cubic feet the total measure of this immense amount of water is about 3,073,000,000.000. Allowing that only 40 per cent of this rainfall is removed by drainage, there yet remains nearly 1¼ trillion cubic feet of water to be carried by the numerous rivers of the State into the ocean. Assuming the mean height of the State to be 600 feet, it is easy to calculate in general terms the power that is generated by this water before it reaches the sea. Thus allowing that the water carried away by the rivers is annually about 1,229,200,000,000 cubic feet, it is plain that this amount of water falls through the mean distance of 600 feet. At each foot of fall, it is estimated 4,429 horse power are generated, which, multiplied by 600, gives 2,656,200 horse power, which it is not unfair to represent by the working energy of over 34,000,000 able-bodied men (or nearly twice as many as there are at present in the United States) laboring throughout the year without intermission for food or sleep.

This almost inconceivable power is distributed throughout the State in lakes and rivers. The importance of the lake system of Maine is appreciated by no one who has not studied it. There are only three or four districts of the same size upon the globe that can at all compare with Maine in the extent of its lake surface. The Kennebec River has more lakes connected with it than the gigantic Orinoco, and the Penobscot than the Amazon. Without counting the smallest variety, there are in Maine between 1,500 and 1,600 lakes, having a total area of between 2,000 and 3,000 square miles.

Looked at in their relation to power, the lakes have an especial value. They are all, with scarcely an exception, connected with the various river systems of the State, and are, moreover, in the majority of cases at such high elevations that their positions make them storehouses of potential energy, which needs but to be properly tapped to set the wheels of industry in motion even hundreds of miles away. Eight of the large lakes have their surfaces over 1,000 feet above the level of the sea, while the waters of Rangeley are over 1,500 above the ocean, or but a few feet below the level of Lake Itaska, the source of the Mississippi. Connected as they are with the rivers, they act, moreover, as reservoirs for the gathering of the drainage, which can be sent down through the rivers in much more uniform quantities than would be possible were they not present to serve as checks.

It is impossible here to go into details concerning the rivers of Maine and the unrivaled opportunities they present to manufacturers who wish to put up small or large establishments. The rivers are there and are yearly carrying unused into the sea millions upon millions of horse power, fully 75 per cent, if not more, of their energy going at present utterly to waste. The time has arrived for the harnessing of these streams, and the investor or manufacturer who hastens to build beside them the factory or the electric generating station, with its miles of copper wire for power transmission to distant cities, is assured of a return for his capital, his trouble, and his good judgment which he could not so surely obtain in any other way.

There is much which we have not the space to add, but perhaps enough has already been said to awaken the interest of the reader to such an extent that he will investigate the subject for himself; and it is not entirely impossible that at some future time we may return to a subject which is so fascinating, and concerning which it is impossible to say the last word. —*Manufacturers' Gazette.*

Steam Power from House Dust.

The Refuse Disposal Company, London, have lately published a pamphlet on the question as to the practical means by which the dust refuse of towns can be utilized for electric lighting purposes. The company claim that 20,000 tons of house dust, if treated as they suggest, and burnt in suitable boilers, might be made to produce as much as 5,600,000 indicated horse power hours, equal to an engine of 1,183 indicated horse power working for 4,734 hours, for electric lighting.

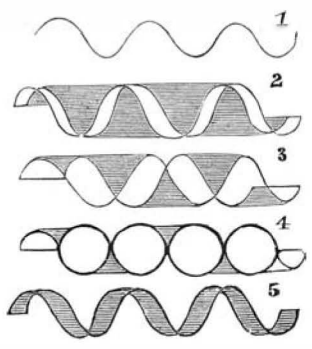
EXPERIMENT IN PERSISTENCE OF VISION.

T. O'CONOR SLOANE, PH.D.

A method of illustrating persistence of vision with the production of very pretty and varied effects is shown in the accompanying illustrations. Briefly stated, it consists in rapidly vibrating different designs. By persistence of vision these designs produce varied effects which change with the amplitude of vibration. While for producing such vibration simple agitation by hand may be measurably successful, a special vibrator is shown in the cut, which is very simply constructed, and which far exceeds in its results the hand of the operator.

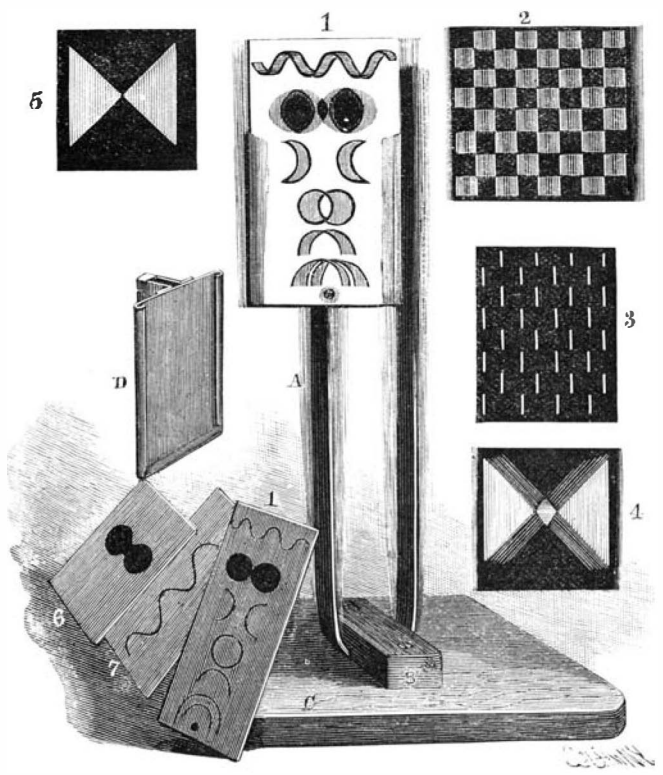
To make the vibrator a long flat bar of brass is bent into U shape. The bar may be 30 inches long, half an inch wide and one-eighth inch thick. This makes a sort of tuning fork, as shown in the cut at A. The block of wood, B, slotted to receive the bend of the tuning fork, is screwed on the base, C, securing the fork thereto.

The fork thus mounted will have an amplitude of vibration of half an inch or more. The designs to be vibrated may be drawn upon paper and may have paper loops pasted on their backs to receive the end of the tuning fork, so as to be thereby secured to it. It is, however, more convenient to make a frame such as is shown at D, of very thin metal or else of paper. At the back is a long band or loop to receive the tuning fork just described. This loop is partly or entirely closed at its upper end to prevent it from dropping down toward the bend of the brass bar. When in place different designs can be inserted into it in front, the inwardly turning portions or flanges holding the design in it.



Various examples of designs are given. Fig. 3 is a blackened piece of paper with short white lines drawn and distributed as shown. When vibrated this seems to widen out, the white lines become squares, and when the proper amplitude of vibration is reached an almost perfect checker board, Fig. 2, results.

Fig. 5 shows another design, which speaks for itself. When vibrated, a very peculiar effect is produced, one of the phases of which is shown in Fig. 4. A variety of designs can be placed on the same piece of paper. Fig. 1 shows such a piece of paper, and one of its effects is shown in the drawing of the tuning fork



EXPERIMENT IN PERSISTENCE OF VISION.

itself. Crescents, intersecting circles and other peculiar effects are produced from the designs shown in Fig. 1. The most interesting of the figures is the sinuous line with horizontal axis shown at the top of Fig. 1. As the fork's amplitude of vibration continually decreases, each design, as vibrated, produces successively a number of effects, and in none is this better shown than in the horizontal sinuous line.

In the small cuts the changes such a line undergoes are illustrated. Number 1 shows the line; number 2 the appearance produced with a considerable amplitude of vibration. As the beat of the fork diminishes, number 3 and then number 4 appear. In the latter for an instant almost a perfect series of circles results. This is but for an instant, as, while one watches them, the circles merge into a ribbon as shown in number 5, which grows narrower and narrower as the swing diminishes in extent. In Figs. 6 and 7 other designs are shown. In Fig. 7 will be recognized the sinuous line designed to be vibrated when in a vertical position. A very pretty effect produced by a semicircle with horizontal axis is specially worthy of being noticed. Every design gives not only new effects varying with the amplitude of vibration, but different positions of the same design produce quite different results.

The Action of Alkalies on Glass.

BY F. FOERSTER.

The following facts concerning the action of solutions of alkalies and acids upon glass have been collected from the results obtained by the author and others who have experimented in this direction.

1. Solutions of caustic alkalies act upon glass much more strongly than water, since, except in very dilute solution, they dissolve all the constituents of the glass as such.

2. Of the caustic alkalies, the most active is caustic soda, then follows caustic potash, and then ammonia and baryta water.

3. Rise of temperature increases the action of the alkalies very considerably.

4. The action of the alkaline solution increases with the concentration, at first rapidly, but afterward only very slowly.

5. Highly concentrated solutions at the ordinary temperature have less action than more dilute ones.

6. Pure alkaline solutions, not too highly concentrated, have less action upon glasses than such as have been rendered impure by small amounts of silicic acid.

7. Alkaline carbonates, even in very dilute solutions, attack glass much more strongly than water. Their mode of action corresponds rather with that of other salts than with that of the caustic alkalies. In equivalent concentration, solutions of sodium act more powerfully than those of potassium carbonate.

8. The action of salt solutions upon glass is made up in a manner which varies with the concentration and the kind of salt, of the action of the water itself, and that of the salt which is present.

9. Both these modes of attack are differently influenced by the composition of the glass.

10. These salts act more strongly than water whose acids form insoluble lime salts. The action of these increases with concentration.—*Chem. Tr. Jour.*

Elastic Foundations for Engines.

The desirability of mounting gas engines and other motors used in town industries upon spring foundations having been mooted in *Industries*, Mr. Robert H. Smith, of the Mason College, Birmingham, writes to that paper expressing his views on the subject. He remarks that all foundations are in some degree "springy," and that the really practical question is as to the amount of springiness to give to the foundation under stated conditions of working of the machine, and under what conditions it is desirable to make this springiness as nearly zero as we can get it. He goes on to narrate how a gas engine in Birmingham was lately causing much annoyance by the vibration and noise it created in the building in which it was placed. An attempt was accordingly made to remedy the evil by mounting the wooden sole plate that carried the engine and the dynamo driven by it upon a dozen rubber pillarets, 3 inches diameter and 4 or 5 inches high. The result was a failure; the oscillations of the engine bed plate being excessively violent and irregular. Mr. Smith proceeds to discuss the nature and operation of the stresses tending to produce oscillations in a combined arrangement of gas engine and dynamo; and he concludes that any solution of the difficulty must be of the nature of a compromise between the giving of annoyance by vibration and damaging the machinery by shaking. He recommends, in case a spring cushion and a massive brick, stone, or concrete foundation can be used in combination, the putting of the former underneath the latter, to the top of which the engine bed plate should be bolted as hard and fast as possible. Of course, such a situation for the spring cushion would be a permanent one; and therefore rubber would not be a suitable material of which to make it, because its elasticity is soon lost under severe stress. If they could be secured from rotting, it might be supposed that a pitful of brushwood fascines would be the ideal spring cushion to put underneath a masonry engine foundation. Perhaps alternate layers of tarred felting and corrugated steel sheets would act well. A thick layer of felt is probably the cheapest.

A TRAVELER in the Maine backwoods this season was somewhat surprised on coming upon a lumberman's camp, full thirty miles from any settlement, to hear the music of an organ and the strains of an operatic air. He was met on entering the camp by the organist, a bright, neat Maine girl, who he found was also the cook, who had taken along her parlor organ out to camp to entertain her father and his crew in the long evenings during their stay in the wilderness.

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RECENTLY PATENTED INVENTIONS.

Engineering.

FURNACE.—Ivor J. and Robert Monger, Baltimore, Md. This is a regenerative and reverberatory furnace for smelting and refining copper, to quickly reduce low grade matte without previously pulverizing and calcining it, while rendering unnecessary the process of skimming and tapping. The furnace is semicircular, having an arched top and an outlet spout in its sides, with blast pipes arranged on the sides, and tuyeres at the upper edges extending into the interior, whereby the blast may be diretced upon the surface of the molten metal, means being provided for imparting a tilting movement to the furnace.

BOILER.—Ferdinand J. Thrun, Romeo, Wis. Two bottom water drums are arranged on the sides of the brick work, diagonal tubes leading from them to top water drums, and vertically arranged return tubes connecting the bottom water drums with side top drums, sets of pipes connecting the top water drums with each other, while mud drums extend transversely below the water drums, with which they are connected by short tubes. The construction is simple and durable, the boiler being designed to quickly and economically generate steam and insure a perfect circulation of water.

Railway Appliances.

LOCOMOTIVE ENGINE PILOT. — Furman F. Mortimer and John P. Coffin, Florence, S. C. Strongly braced to the front cross beam of the truck is a triangular frame, along whose front side, diagonally to the tracks, is a trough-shaped chute, semicircular in transverse section, with its concaved sides to the front and extending across both the rails, the lower edge of the chute extending forward horizontally, to enable the pilot to easily take up and lift an object into the trough of the chute. This pilot is designed to throw objects entirely away from the rails, without throwing them on adjacent rails, and with the least danger of mutilating and killing living things.

ELECTRIC ELEVATED RAILWAY.—Andrew L. Rutter, Washington, D. C. The cars of this railway are cylindrical and have conical ends, and are suspended beneath the track from wheeled trucks running on the track, the motive power being preferably supplied by a storage battery. Each car is suspended by a jointed coupling from yokes attached to the wheeled motors on the track above, and the seats are suspended from the roofs of the cars, the couplings between the two pairs of motors of contiguous cars being so constructed as to enable them to yield to tension and resist thrust elastically.

CAR COUPLING.—John P. Derr, Greenville, Pa. This invention provides a peculiar construction and arrangement of levers whereby the drawhead may be raised for coupling or uncoupling in such a manner that the lever upon one side is wholly disconnected from and independent of the lever upon the other side, or the top of the car, so that the operation of one lever does not move or disturb any of the others. The drawbars each consist of a flat bar of iron or steel, having an upwardly and a downwardly extending hook on the end, and slotted, and in coupling one drawbar is raised above the plane of the other, the hooks passing into the slots as the cars come together.

CAR COUPLING. — August G. Vogt, Boerne, Texas, In the drawhead of this coupling is arranged a sectional link holder, the upper and lower sections of which are pivoted together near their rear ends to the drawhead, and have near their front ends pin openings closed at their front sides, with operating devices whereby the sections may be flared apart at their front ends. In combination with a transverse main operating lever for the link holder and coupling pin levers, is a swinging weighted latch to lock the main lever in position. The cars are coupled automatically by the device and they may be uncoupled, or the link adjusted for a meeting drawhead, without the trainmen going between the cars at any time.

Mechanical.

DUPLEX SPINDLE.—Joseph Duffy, Paterson, N. J. The bolster of this device comprises a central trunnion, upon which, as a common center, oppositely extending arms are journaled and adapted to oscillate, spindles being carried by the arms at their outer ends, while a spring is held between laterally extending lugs near the inner ends of the arms. The invention is an improvement on a formerly patented invention of the same inventor, the spring mechanism taking up the slack of the belts or bands, and causing the spindles of the spinning frame to be driven with substantially the same speed and power.

MACHINE FOR CUTTING KEYWAYS.—Gottlob F. Grotz, Bissingen, Wurtemberg, Germany. In this machine the tool is held by a tool holder attached to a vertically movable slide contained within a longitudinally movable carriage operated by a rack and pinion, the slot being cut during the longitudinal movement of the carriage. The vertical slide which holds the tool is alternately raised and lowered during the operation of the machine by two fixed trips engaging with a suitable cam, thus lowering the tool into the slot at the commencement of the stroke and raising it at its conclusion.

WALL PAPER TRIMMING MACHINES.—Henry B. Tiffany, Clyde, Ohio. This invention consists of a slotted paper-receiving roller and a reciprocating plunger for pushing the end of the paper into the slot to attach the paper to the roller. The paper passes over the usual feed board extending from the trimming machine to guide the paper to the receiving roller, and the attachment is of simple and durable construction.

DRIVING GEAR FOR HOISTING DRUMS.—Patrick White, Perth Amboy, N. J. The drive wheel, according this invention, is made with a removable rim having gear teeth and having a removable drive section of a friction clutch, the hoisting drum carrying the driven section of the friction clutch, the latter consisting of an integral rim on one end of the hoisting drum, the friction blocks being held to the rim by cruciform lugs, and a retainer ring being held on the rim, overlying the faces of the blocks and serving to prevent their outward movement. The construction is such that parts may be removed when damaged without a loss of the whole.

Agricultural.

THRASHER, FEEDER, AND SEPARATOR.—Milon O. Godding, Monrovia, Cal. This is a combination machine in which the several parts automatically operate to feed, thrash, and separate the grain in a quick, continuous, and effective manner. A feeder frame is detachably held on the front end of the main frame, a band cutter being journaled transversely over the delivery end of the apron, and a picker cylinder arranged over the carrier, the grain being fed under a beater onto arms and dumped onto an inclined straw carrier, the grain being constantly jumped from one pocket to another of shoes having a peculiar circular motion. The straw is similarly treated until elevated to the carrier for delivery to the stacker, being constantly agitated by knocker arms, the separated grain being subjected to air blasts and thoroughly shaken before being carried to the elevator.

BELT GUIDE FOR THRASHING MACHINES, ETC.—William L. Schwaller, Halbur, Iowa. This invention provides a mechanism of simple and economic construction, conveniently operated, for holding in place and guiding a belt even in the face of a high wind, where a long belt is run in the open air, obviating undue friction and wear and tear. The guide has a base to which are attached shafts upon which friction rollers are longitudinally adjustable, a latch mechanism connecting the shafts at their upper ends, the boxes on the shafts being adjustable to and from the friction rollers, while braces entering the ground hold the device upright against the wind.

MILK PAIL.—William R. Watt, Somerville, Tenn. This pail or milk bucket is so made that a removable strainer may be quickly and conveniently combined with it, to strain the milk as fast as it is milked or poured into it. The strainer rests on the edge of the pail and has a funnel-shaped bottom, with an outlet having a strainer and closed by a spring-pressed valve, while a cover fits the pail on the upper end of the strainer. All danger of spilling the milk is avoided, with this improvement, and the milk is cleansed from impurities at the time of placing it in the pail.

Miscellaneous.

GAS GOVERNOR.—Benjamin E. Patterson, New York City. This is an improvement in governors having outer and inner wells, the latter balancing the valve, and the invention provides a simple governor to efficiently regulate the flow and prevent waste, delivering the gas at a steady and uniform pressure. To this end the regulating valve and the well floats for actuating it are arranged so that the movement of the valve will be steady and positive, while preventing all jumping, rattling, and telegraphing through the connected parts.

HYDRANT CAP RETAINER.—Salisbury F. Rosse, Sedalia, Mo. This is a device for use instead of chains for connecting hydrant caps to the bodies of hydrants, the chains frequently becoming rusty so they will not turn around the cap. The improvement consists of a curved retaining bar or link, having a slot near each end, the lower one receiving a set screw for attaching the bar to the hydrant post, while the pin of the cap is passed through the upper slot, and a locknut is screwed to place thereon.

TO SEPARATE MATTE FROM SLAG.—William H. Howard, Pueblo, Col. The furnace of this apparatus for separating the matte from slag in lead and coffee smelting is provided with the usual outlet spout, to discharge the matte and slag into a settler, preferably mounted on wheels to be conveniently moved to and from the furnace. The settler has a vertically movable partition in which is arranged a water pipe connected with flexible inlet and outlet pipes, in connection with means for supporting, counterbalancing, and raising and lowering the jacket. The apparatus also deadens the flow of the matte and slag from the furnace to the settler.

GRAVEL WASHER AND SEPARATOR.—Franklin T. Gilbert, Walla Walla, Washington. Two patents have been granted this inventor for improvements on a former patent for a machine in which the mixed water and gravel is passed through a series of screens of different mesh to separate the gravel from the water and the coarse from the finer grades. Means are also provided for a second flushing and grading treatment for each grade by itself before the final discharge into the bins, a continuous separation of the materials being effected in a rapid and economical manner. A screen body or disk is held to be rotated transversely to the direction of the feed, and a screening body with projecting portions is arranged to receive the impact force of the mixed water and gravel as it is discharged against the screen, and upon which the gravel is temporarily lodged, the weight of which serves as additional means for rotating the screen.

GRAVEL SCREENING MACHINE.—This is a further invention of the same inventor for a machine adapted to take a mixture of gravel, sand, and dirt, and separate therefrom the gavel, wash it, and divide it into as many grades of different sizes as desired. A series of conical open-ended rotating screens is arranged in steps below a supply hopper, chutes receiving and delivering the material and water to the successive screens according to the number of divisions to be made.

EVAPORATING APPARATUS. — William Golding, New Orleans, La. This improvement is designed to facilitate the recovery of solid matters from solutions, a box-like structure below the supply tank having a series of imperforate treads and perforated risers over which the solution is passed to a receiving tank at the bottom, while a hot air blast is directed from the bottom to the top, the air currents passing through the perforated risers, so that the solution is very freely exposed to the air currents.

PNEUMATIC CONVEYER.—William E. Vernon, Sipe Springs, Texas. The car of this device is supported by brackets having on their lower ends runners fitting in tubes forming the tracks of the conveying mechanism, the brackets passing through slots ordinarily closed by flaps, and the car is engaged at its rear by a pusher on the end of an arm extending upward from a plunger sliding in a tube between the tracks. The plunger is made in sections, to follow the curves of the tube, which is connected at one end with an air compressor, and the slot in the top of the tube in which the arm of the pusher travels is closed by a valve of flexible material secured on the inside of the tube.

TIME LIGHTING DEVICE.—Antonio B. y Dias, Havana, Cuba. This is a simple automatically working apparatus which may be applied to any alarm clock, and which, when the alarm goes off, will, by the movement of the hammer of the clock or its key, automatically strike a match, the latter being so arranged, if desired, as to light a fire. One end portion of the base plate of the device is curved to fit the top of a small circular alarm clock of the ordinary pattern, a perforation fitting upon the standard which supports the gong, although the attaching portion of the plate may be shaped to fit a clock of any shape.

FIRE OR BURGLAR ALARM.—Elzear La France, Worcester, Mass. A supporting block attached to a ceiling or other support is surrounded by a metallic band forming one terminal of an electric circuit, springs arranged circumferentially around the block forming each another terminal. Attached to each spring is a string of just sufficient strength to hold the spring out of contact with the band, these strings radiating to the different points to be connected with the alarm. Should any of the strings be burned by a fire, a spring is released to close the circuit, and an alarm is sounded, or the strings may be connected with windows, doors, etc., by the movement of which the strings will be broken or loosened to sound the alarm.

OPERA CHAIR.—Herman A. J. Rieckert and Louis F. Kwiatkowski, New York City. This is a conveniently foldable chair for forming longitudinal passageways or aisles in theaters, in addition to the ordinary transverse aisles. To a longitudinal frame a seat frame is pivoted to swing vertically, a seat hinged to the upper rear edge of the seat frame swinging vertically at right angles to the direction in which the seat frame swings. By arranging each frame with two seats an aisle of a width equal to two seats may be formed when the seats are swung up into folded position, the chairs also being of such construction as to afford the occupant all desired comfort.

TRANSOM LIFTER.—John P. Kettering-ham, Natchez, Miss. This invention consists of a drum carrying a rope connected with a block pivotally connected with a bracket held on the device to be lifted, the block serving to lock the transom when closed. The device is of simple and durable construction, very effective in operation, and designed to conveniently lift transoms, windows, drop doors, etc., holding them in any desired open position, or securely locking them when closed.

VEHICLE WHEEL.—Alexis F. Gillet, Kearney, Neb. This is a metal wheel with tire-tightening devices, and is adapted to be fitted to any vehicle having axle boxes. To the larger end of the box is fitted a flanged piece, provided with a projecting sleeve forming the sand box, while near the outer or smaller end of the box is fitted another flanged piece, outside of which is an internally threaded sleeve. The felly and tire are drilled and threaded to receive a threaded sleeve for each spoke, and after inserting the outer ends of the spokes, in building up the wheel, their inner ends are placed between the flanged pieces and clamped in place by screwing up the outside sleeve. At any time after the wheel is put together, the spokes can be tightened, if necessary, in the tire.

DEVICE FOR RAISING LOADED TRUCKS.—Benjamin H. Stephens, Woodland, Cal. This invention provides a frame adapted for quick and ready attachment to two-wheeled trucks to facilitate lifting the latter into a car or upon a platform as desired, the frame being also quickly detachable from the truck, and the latter being all the time under the supervision of the manipulator.

BRUSH.—James E. Provine, Ridgewood, N. J. This brush has an inclosing case held to it, the brush being movable in the case to project it out for use, while internal stops limit its outward movement. The brush has two sections, one provided with bristles and the other with plush for brushing silk hats, etc., either brush section being ready for use while the other is covered, and the whole being conveniently inclosed in a case which may be carried in one's pocket or in a small valise or satchel.

CLOTHES DRIER.—John F. Hanson, Macon, Ga. Arms are suspended from parallel shafts turning in hangers, and frames pivotally attached to the arms are connected by bars, a driving mechanism applied to the arms giving a laterally reciprocating movement to the frames. The frames carry any desired number of bars upon which dyed articles or other goods to be dried may be hung, and the peculiar movement imparted to the machine causes the air to circulate through them in such a manner that the drying is quickly effected and the dye is evenly fixed.

UMBRELLA CANE.—Rufus Waples, Jr., New York City. This invention provides a combined cane and umbrella of light, durable, and economic construction, in which the umbrella canopy may be folded up and concealed in the cane, which will then have the appearance of an ordinary walking stick, or the canopy may be readily taken from the interior and mounted on the cane to form an umbrella.

Designs.

FURNITURE CASE.—Paul Kurtz, Marshalltown, Iowa. This case is made with the two front vertical corner pieces formed as sunken panels, with curved surfaces bearing ornamental carving.

SURFACE ORNAMENTATION OF GLASS.—William L. Pilkington, St. Helen's, England. This design consists in configurations in the form of rosettes made in whirls, the arms of which emanate from a common center and curve in the same direction, the rosettes forming scalloped circular borders.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

NEW DYNAMO TENDER'S HAND BOOK. With one hundred and forty illustrations. By F. B. Badt. First Edition. Chicago, Ill.: Electrical Publishing Company. 1892. Pp. 226. No index. Price $1.

The preface of this little work states that 9,000 copies of the Dynamo Tender's Hand Book have been sold, so that the author proposes the issuing of a new book, and this appears as its first edition. It seems well got up and covers the ground reasonably well. It is throughout characterized by the practical style of treatment adopted by the author in his other works, but lacks an index.

THE WELL DRESSED WOMAN. By Helen Gilbert Ecob. New York: Fowler & Wells Co. 1892. Pp. 253. Price $1.

This excellent work details the absurdities that the fair sex indulge in in their dress and recommends a more hygienic treatment of the subject. It seems to be eminently practical in its treatment and at the same time enters into the subject scientifically. It inveighs against the corset and claims that a properly dressed and artistically developed figure is far better without this adventitious support. Numerous illustrations of artistic dress are given, which certainly, if they do embody dress reform, do so without any sacrifice of the artistic effect.

DEEP SEA SOUNDING. By Captain A. S. Barker. New York: John Wiley & Sons. 1892. Pp. iv, 133. Price $2.

This is an abbreviated log book of the deep sea sounding executed under Captain Barker's command, and forms a valuable memoir of the work he did. Several large charts display at a glance the route and operations.

SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY, 1893, NUMBER.—(No. 87.)

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1. Elegant plate in colors, showing a very attractive dwelling at Bridgeport, Conn., erected at a cost of $15,000 complete. Floor plans and perspective elevations. Joseph W. Northrup, architect, same place.
2. Plate in colors showing a residence at Armory Hill, Springfield, Mass. Two perspective views and floor plans. Mr. Francis R. Allen, architect, Boston, Mass. An excellent design.
3. A cottage at Brookline Hills, Mass., erected at a cost of $4,825 complete. Perspective views and floor plans. Messrs. Sheply, Rutan & Coolidge, architects, Boston. A picturesque design.
4. A dwelling erected at Holyoke, Mass., at a cost of $6,500. Floor plans, perspective, etc. Mr. G. P. B. Alderman, architect, same place.
5. A very attractive and convenient stable and carriage house erected at Plainfield, N. J., at a cost of $1,500 complete. Messrs. Rossiter & Wright, New York, architects.
6. A residence recently erected at Plainfield, N. J., at a cost of $9,175 complete. A picturesque design. Two perspective elevations and floor plans. Messrs. Rossiter & Wright, architects, New York.
7. An elegant residence recently erected at Malden, Mass., for Mr. B. G. Underwood. Two perspective views and floor plans, together with a view of the Holland stairway. Cost complete about $11,000. Mr. Frank L. Smith, architect, Boston.
8. A substantial residence at Holyoke, Mass. Perspective elevation and floor plans. Mr. H. H. Gridley, architect, Springfield, Mass. An excellent design.
9. View of the Union Passenger Station, Worcester, Mass.
10. Miscellaneous contents: Combustible fireproofing.—House drainage.—Roofs and roof coverings.—Wall papers.—A plea for the use of white in house painting.—Defective flues.—Antiquity of glue and veneering.—The piping of dwellings.—Collodion glass.—A saw for foot, hand, or steam power, illustrated.—A new court house at Greenville, Miss.—A baluster spindle lathe, illustrated.—Solid partitions.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(4639) N. M. C. asks: Which of two bricks of equal dimensions and weight will require the greater force to move them—the one to be placed on its side, the other on edge, say for instance, the bricks are 4 inches wide by 8 inches long by 2¼ inches thick? A. Friction is independent of the extent of surface in contact, when the pressure remains the same, but is proportional to the pressure. There is no difference in the frictional force to move the bricks, whether they lie flat or edgewise.

(4640) B. A. H. asks: Is there anything that can be used on soft coal that will prevent clogging with soot the stove, pipe, etc., and will aid in the combustion? A. There is nothing but perfect combustion that will burn the smoke and prevent soot in the pipe. Any oxidizing chemical will cost too much. There are stoves in the soft coal districts with under feed that burn the smoke, which is the cheapest and best way to prevent soot in the pipe.

(4641) J. M., writing from Merida, Yucatan, says: From the coast to this city so many crabs have lately been brought that they have been sold very cheap and have been eaten by almost every one. At the same time many persons have fallen sick and several died with symptoms very like those of cholera, causing great consternation. Death has been produced in a few hours, and patients have felt terrible pains and become very cold and blackish (cyanotic, physicians call) and with copious dejections, very bloody. The selling of crabs and fish has been forbidden. The flesh of crabs and patients' dejections have been found, under the microscope, to be full of living organisms (bacteria) that no one has classed yet, and which may be the source of the trouble. Some people believe the crabs were cooked in copper boilers. Others think the crabs were poisoned by eating poisoned fish or poisoned fruit at the shore. Others say the crabs probably were decayed before sale, and remained unsold on account of abundance, total decomposition having been checked by daily heating. How do you explain the matter? Did you ever hear of such a case? A. Sometimes shell fish cause cholerine and rash even when fresh. Merida is 20 miles from sea coast and about 60 miles from the principal seaport by rail. Dead crabs, or crabs dying on the way, would decompose, and while boiling would kill the bacteria, it would not destroy actual poisonous agents, the ptomaines, which are produced by the action of bacteria on animal tissue. Even crabs boiled two or three days before reaching Merida, and then reboiled before eating, might become reinfected in the interval, and in both cases the ptomaines might produce fatal symptoms resembling cholera. A notedcase is one occurring in England, in 1887, when at a wedding breakfast a ham pie was served. Every one who ate of the pie was poisoned, and nearly all died, including the bride and groom. Examination showed that the ham was decomposed before boiling, but the resistent ptomaines were found in the boiled ham in sufficient quantities to cause fatal poisoning. Boiling in copper vessels would not cause such poisoning. As to bacterial examination of the dejecta, bacteria of all kinds are normally found, and the only bacterium known that would be of any aid to the cause of the outbreak would be the "comma bacillus" of cholera.

(4642) R. L. B. writes: 1. I have an electro-magnetic machine that has lost its electric force. Can the magnet be recharged? A. The magnet can be recharged by the usual methods, but it probably will not retain its charge longer than it did in the first instance. 2. What causes it to lose its electric power? A. The steel of which the magnet is composed may be too soft, or possibly the magnet has been subjected to jarring or concussion. 3. Where can I send it to have it recharged? A. Any one having a good sized electro-magnet can recharge your magnet by applying it to the poles of the dynamo.

(4643) H. M. W., Dakota, asks: Is hard coal in use upon any railroad for steaming locomotives drawing full sized trains? A. Anthracite or hard coal is now and has been used for many years on most of the railways in the Eastern States.

(4644) E. M. K.—The eyeglasses are cemented together with Canada balsam. As it requires some practice to do it neatly, better send it to an optician.

TO INVENTORS.

n experience of forty years, and the preparation of more than one hundred thousand applicatio s for patents at home and abroad, enable us to understand the laws and practice on oth continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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January 10, 1893,

AND EACH BEARING THAT DATE.

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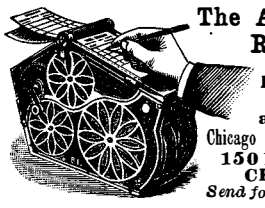

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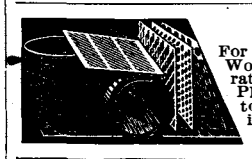

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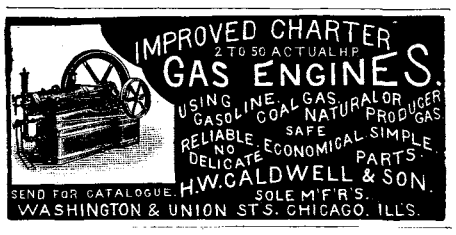

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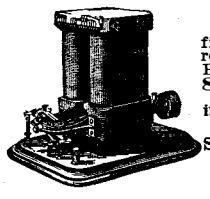

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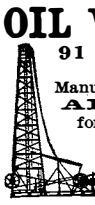

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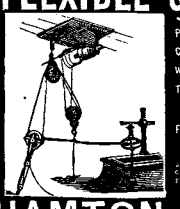

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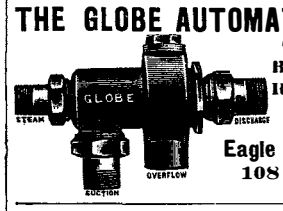

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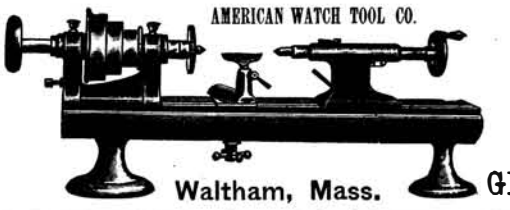

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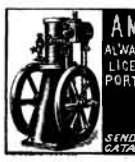

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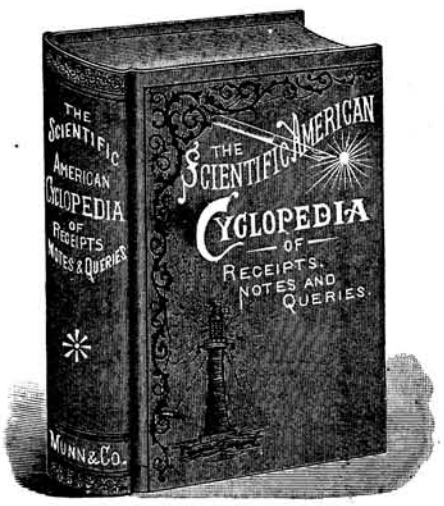

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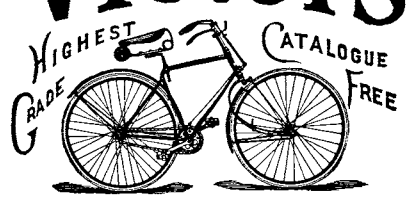

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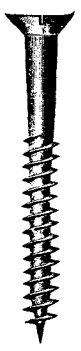

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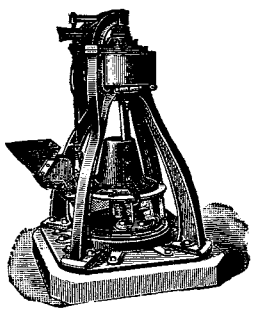

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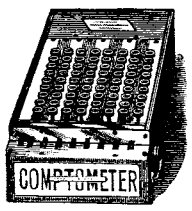

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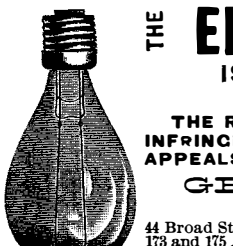

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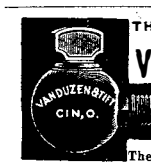

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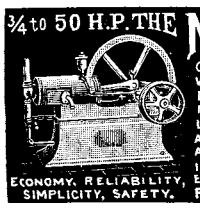

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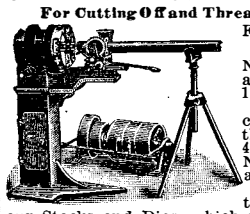

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